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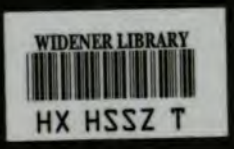
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# VERMONT

# AGRICULTURAL REPORT

BY THE

# STATE BOARD OF AGRICULTURE,

FOR THE

YEAR 1894.

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C. M. WINSLOW,

SECRETARY OF THE BOARD.

BURLINGTON:
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VICTOR I. SPEAR, Braintree, *Statistical Secretary.*

H. W. VAIL, Pomfret.

J. O. SANFORD, Stamford.

Prof. J. L. HILLS, Burlington.

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ORA PAUL, Pomfret.
HENRY CHASE, Lyndon.

1879-80.

Under change of law, JOHN B. MEAD, of Randolph, was "Superintendent of Agricultural Affairs".

1881-82.

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1883-84.

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M. W. DAVIS, Westminster.

1885-86.

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1887-88.

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WILLIAM CHAPIN, Middlesex.

1889-90.

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C. M. WINSLOW, Brandon.

1891-92.

His Excellency, CARROLL S. PAIGE.
MATTHEW H. BUCKHAM, Pres. State Agriculture College.
W. W. COOKE, Secretary of the Board.
R. C. SMITH, Pittsford. | H. W. VAIL, Pomfret.
WM. CHAPIN, Middlesex. | J. O. SANFORD, Stamford.
VICTOR I. SPEAR, Braintree.

# AN ACT IN RELATION TO THE STATE BOARD OF AGRICULTURE.


SECTION

1. Members of board, how appointed; term of office; vacancies, how filled.
2. Meetings of the board.
3. Board of Cattle Commissioners abolished; their duties to be performed by the Board of Agriculture.
4. Duties of the secretary; report, what to contain, number of copies to be printed, how distributed.
5. Compensation of members; expense limited.
6. Duties of board in collecting and publishing statistical information.
7. Acts inconsistent with this act repealed.


*It is hereby enacted by the General Assembly of the State of Vermont:*

SECTION 1. The governor of the State, the president of the University of Vermont and State Agricultural College, and six other persons appointed by the governor and confirmed by the senate, who shall hold their office until the first day of December in that year in which the regular biennial session of the General Assembly occurs next after their appointment, shall constitute the Board of Agriculture for Vermont, for the improvement of agriculture, the general interests of husbandry, the promotion of agricultural education througout the State, and for the discharge of such other duties as are hereinafter set forth. In case of vacancy in the board, from death, resignation, removal from the State or any other cause, the governor shall fill it by appointment as in other similar cases. Said board shall appoint from its number, as constituted by this section, a secretary.

SEC. 2. The board shall hold one meeting in each county in the State annually, and as many more as it may deem expedient, and may employ lecturers, essayists or other aids in conducting said meetings, managing its affairs generally and discharging its duties under this act. At such meetings it shall present subjects for discussion, and among other topics the subject of forestry, and tree planting, and the subject of roads and road making.

SEC. 3. The board of cattle commissioners in and for this State is hereby abolished, and the board of agriculture is directed hereafter to perform the duties of such board.

SEC. 4. The secretary shall, on or before the 30th of June annually, prepare a detailed report of the proceedings and doings of said board of agriculture, with such suggestions in regard to the duties of the board, and the advancing of the interests herein specified as may seem pertinent; and he may append thereto such abstracts of the proceedings of the several agricultural societies and farmers' clubs in the State as may be deemed advisable. The report shall show under separate heads the work of the board upon and concerning the different subjects herein mentioned. Four thousand copies of said report shall be printed as State printing, and be contracted for under Act number one hundred and sixty of the laws of 1884, and paid for like other State printing. Five hundred copies of the same shall be for the use of the General Assembly and the State librarian, and the remainder shall be distributed to the people of the State under the direction of the board of agriculture.

SEC. 5. The members of the board shall each receive the sum of three dollars per day and expenses necessarily incurred in the discharge of their duties, but the entire expenses of the board shall not exceed the sum of $5,000 annually.

SEC. 6. It shall be the duty of the board to collect authentic statistical information, as full as possible, relating to agriculture and agricultural products, farms and farm property, the manufacturing and mining industries of the State, which, under a separate head, shall form a part of its annual reports; and such information shall be complete as to unoccupied farms. The board shall also publish such information in separate form, showing by description and illustration, the resources and attractions of Vermont; also the advantages the State offers and invitations it extends to capitalists, tourists, and farmers; such form of printed matter the board shall place where, in its judgment, it will do the most good in developing the resources and advertising the advantages of the State.

SEC. 7. All acts and parts of acts inconsistent with this act are hereby repealed.

Approved November 22, 1892.

No. 321.—JOINT RESOLUTION DIRECTING THE BOARD OF AGRICULTURE TO INQUIRE INTO AND REPORT UPON THE SUBJECT OF FORESTRY.

*Resolved by the Senate and House of Representatives:*

That the board of agriculture be instructed to inquire into the effect of stripping a country of its forests, upon the soil, climate and health; the necessity and advisability of protecting the same, probable expense and such other facts as they may deem necessary for a clear understanding of the subject, and to embody the same, together with recommendations, in their next report.

F. STEWART STRANAHAN,

*President of the Senate.*

WILLIAM W. STICKNEY,

*Speaker of the House of Representatives.*

## FERTILIZER LAW.

*It is hereby enacted by the General Assembly of the State of Vermont:*

SEC. 1. Every lot or parcel of commercial fertilizers, or material used for manurial purpose, sold, offered or exposed for sale in the State of Vermont, the retail price of which is ten dollars or more per ton, shall be accompanied by a plainly printed statement clearly and truly certifying the number of net pounds of fertilizer in a package, the name, brand or trade-mark under which the fertilizer is sold, the name and address of the manufacturer or importer, the place of manufacture, and a chemical analysis stating the percentage of nitrogen or its equivalent in ammonia, of potash soluble in distilled water, and of phosphoric acid in available form soluble in distilled water, and reverted, as well as the total phosphoric acid. In case of those fertilizers which consist of other and cheaper materials, said labels shall give a correct general statement of the composition and ingredients it accompanies.

SEC. 2. Before any commercial fertilizer, the retail price of which is ten dollars or more per ton, is sold, offered or exposed for sale, the importer, manufacturer or party who causes it to be sold, or offers it for sale within the State of Vermont, shall file with the Director of the Vermont Agricultural Experiment Station a certified copy of the statement named in section one of this act, and shall also deposit with said Director, at his request, a sealed jar, glass or bottle containing not less than one pound of the fertilizers, accompanied by an affidavit that it is a fair average sample thereof.

SEC. 3. The manufacturer, importer or agent of any commercial fertilizer or material used for manurial purposes, the retail price of which is ten dollars or more per ton, shall, before the fertilizer is offered for sale, obtain a license from the State Treasurer, countersigned by the Director of the Vermont Agricultural Experiment Station, authorizing the sale of the same in the State, and shall securely affix to each barrel, bag or other package of fertilizer the word "Licensed," with the number and date of the

license. The manufacturer or importer obtaining such license shall pay to the State one hundred dollars for such license, and the license shall expire on the thirty-first day of December of the year for which it is issued. One license shall cover all brands manufactured by any one manufacturer, corporation or company.

SEC. 4. Manufacturers and importers of commercial fertilizers sold or offered for sale, the retail price of which is ten dollars or more per ton, shall, before such fertilizers are sold, offered or exposed for sale, file with the State Treasurer a bond, with sureties residing within the State, satisfactory to said Treasurer, in the sum of one thousand dollars, payable to the State and conditioned for the payment of forfeitures and costs imposed on such manufacturers and importers for violating the provisions of this act, and such bond shall be renewed from time to time, as the State Treasurer may require.

SEC. 5. The term "Commercial fertilizer," as used in this act, shall be taken to mean compounds and manufactured substances containing or represented as containing, two or more ingredients mentioned in section one of this act, but shall not apply to the separate ingredients used to manufacture the same, or to bone-meal, land-plaster, lime or any substance, the product of nature, which has not been compounded.

SEC. 6. No person shall sell, offer or expose for sale, in the State of Vermont, any pulverized leather, raw, steamed, roasted or in any form as a fertilizer, or as an ingredient of any fertilizer or manure, without an explicit printed certificate of the fact, said certificate to be conspicuously affixed to every package of such fertilizer or manure, and to accompany or to go with every parcel or lot of the same.

SEC. 7. Any person selling, offering or exposing for sale, any commercial fertilizer, without the statement required by section one of this act, or with a label stating that said fertilizer contains a larger percentage of any one or more of the constituents mentioned in said section than is contained therein, or respecting the sale of which all of the provisions of the foregoing section have not been fully complied with, shall forfeit fifty dollars for the first

offence and one hundred dollars for each subsequent offence. This section shall not affect parties manufacturing, importing or purchasing fertilizers for their own use and not for sale in this State.

SEC. 8. All manufacturers and importers of commercial fertilizers, or wholesale dealers in the same, shall, not later than February first, furnish the Director of the Vermont Agricultural Experiment Station with a complete list of the brands, and of agents selling, offering or exposing for sale, such fertilizers, and on the first of each succeeding month till May first such additional agents or dealers as in the mean time have been appointed.

SEC. 9. The Director shall cause one analysis or more of each fertilizer or material used for manurial purposes to be made annually, and the result published monthly. Said Director is hereby authorized, in person or by deputy, to take a sample not exceeding two pounds in weight for analysis from any lot or package of fertilizer, or any material used for manurial purposes, which may be in the possession of any manufacturer, importer, agent or dealer; but said sample shall be drawn in the presence of said party or parties in interest, or their representatives, and shall be taken from a parcel or number of packages which shall not be less than five of the whole lot inspected, and shall be thoroughly mixed and then divided into two equal samples and placed in glass vessels, carefully sealed, and a label placed on each stating the name of the brand of the fertilizer or material sampled, the name of the party from whose stock the sample was drawn and the time and place of drawing, and said label shall be signed by the Director or his deputy and by the parties or party in interest, or their representatives present at the drawing and sealing of said samples; one of said duplicate samples shall be retained by the Director and the other by the party whose stock was sampled. The Director of the Vermont Agricultural Experiment Station shall notify the State Treasurer of all violations of this act, and the State Treasurer shall commence a suit, in the name of the State, on the bond required to be filed by such manufacturer or importer, and prosecute the same to final judgment. It shall be the duty of the Treasurer upon ascertaining any violations of this act, to forthwith notify the manufact-

urers and importers, in writing, and give them not less than thirty days thereafter, in which to comply with the requirements of this act. But there shall be no prosecution in relation to the quality of the fertilizer or fertilizing material, if the same shall be found to be substantially equivalent to the statement of analysis made by the manufacturers or importers.

SEC. 10. The term importer, for all the purposes of this act, shall be taken to mean all who procure or sell fertilizers made in other states.

SEC. 11. Number one hundred and nineteen of the acts of 1882, and number eighty-nine of the acts of 1884 are hereby repealed.

SEC. 12. This act shall take effect January 1st, 1889.

Approved November 27, 1888.

# REPORT OF THE SECRETARY.

*To the Senate and House of Representatives of the State of Vermont:*

The past year has been one of unusual prosperity to the farmers of this State, if we may judge from the general tone of expression at the institutes the past winter.

Farmers everywhere report losses of accumulated earnings by reason of the general financial depression, especially in Western investments. This has perhaps led them to look to our own State with more confidence, and put their money back into the business that has earned it for them. Dairying seems to be on the increase all over the State. More cows and better breeds are sought. Factories have been erected. Good feeling has been established by the new system of paying for milk on its test value, and the butter dairy farmers especially seem well satisfied with their business, and Vermont still holds her merited leadership as a butter producing state.

A few cheese factories have been added to the list, but the industry is not what it should be in Vermont. There is no reason why she should be behind Canada or any of the States in producing a large amount of cheese of the first quality.

Cheese is in good demand and at paying prices, and while our State stands second to none in butter she should also lead in cheese. This division of product would allow her to increase her number of cows, and tend to balance the dairy product, and its consequent dairy revenue.

The horse industry of Vermont is in sympathy with the times, and none but good horses bring a paying price. In this the farmers need to learn the lesson that real goodness and actual worth are the prime requisites for profitable horse breeding.

The sheep industry is no longer profitable at the price of wool and mutton, but the wise farmer will hold on to his choicest ewes,

and thus be ready to reap a harvest when his neighbors have sacrificed their flocks.

The rush of farmers to get rid of sheep at any price the past year has loaded the market beyond its regular demand and forced prices below the line of profit.

The increase of poultry raising has added to the revenue of the farmer without much additional expense, and might be still further increased with good results.

As a rule, the revenue of the farmers is confined to the live stock industry, and his great expense is in providing food for stock and to keep up the fertility of the farm. The trouble with many of the farmers is that the money they receive from the sales of the farm is paid out for grain to support the stock, and commercial fertilizers to support the land, when this money should all or nearly all be saved. Better stock should be kept and in more comfortable quarters. Better provision should be made to preserve the strength of the manure. More effective methods of applying the manure to the land should be devised, thus making more fertile land, raising larger crops, and increasing the revenue of the farmer.

To the intent that this may be the result, and that the exchange of thought and practice may develop better methods for the attainment of higher success, the Board have labored earnestly the past winter in holding as many Institutes as possible, and have striven to learn the needs of each several locality and bring to that section such subjects for discussion as seemed most needed; unusual pains has been taken to advertise the meetings, and the result has been most gratifying in the increased attendance and lively interest taken in the meetings.

Never before has the Board received so many pressing invitations to hold meetings.

Many more meetings than usual were held the past winter, and nearly enough invitations were received to fill the next winter's programme.

The towns in which we have held Institutes are as follows:

| | |
|---|---|
| Georgia | December 5 and 6, 1893. |
| Alburgh Center | Dec. 7 and 8, " |
| West Concord | Dec. 12 and 13, " |
| Irasburgh | Dec. 14 and 15, " |
| Johnson | Dec. 19 and 20, " |
| Walden | Dec. 20, " |
| Ryegate | Dec. 21 and 22, " |
| Newbury | Dec. 22, " |
| Marshfield | January 2 and 3, 1894. |
| Washington | Jan. 4 and 5, " |
| Stowe | Jan. 5, " |
| Braintree | Jan. 16 and 17, " |
| East Bethel | Jan. 18 and 19, " |
| Hartland | Jan. 19, " |
| Pomfret | Jan. 23, " |
| Ludlow | Jan. 23 and 24, " |
| Grafton | Jan. 25 and 26, " |
| Putney | Jan. 30 and 31, " |
| Townsend | February 1 and 2, " |
| Readsboro | Feb. 2, " |
| Bennington Centre | Feb. 6, " |
| Dorset | Feb. 6 and 7, " |
| Peru | Feb. 8 and 9, " |
| Fair Haven | Feb. 13 and 14, " |
| Pawlet | Feb. 15 and 16, " |
| Ira | Feb. 16, " |
| Orwell | Feb. 20 and 21, " |
| Bristol | Feb. 22 and 23, " |
| Huntington | Feb. 23, " |
| Essex | Feb. 27 and 28, " |
| Westford | March 1 and 2, " |
| Fairfax | Mar. 2, " |
| Pittsfield | Mar. 8, " |
| Barnard | Mar. 9, " |

Brandon, Vermont.

C. M. WINSLOW,
Secretary.

# INSTITUTES.

The following papers and discussions are selections from what was presented at various institutes during the past winter, and are arranged by topic for the convenience of the reader:

## BEES.

### PAWLET INSTITUTE.

Mr. J. E. Crane, of Middlebury, read the following paper on Bees and Fruit.

Some time ago there appeared in the Rural New Yorker a discussion as to the value of bees as agents in the fertilization of fruit blossoms. Later, Gleanings in Bee Culture, published at Medina, Ohio, took up the subject, asking all interested to give their views for or against the value of bees. Only two writers cared to take the negative side, while many facts were brought out showing the value and even necessity of bees for the successful production of fruit, some of which will be given in this paper.

The fertilization of flowers has attracted much attention during the last century, and many volumes have been written on this subject. The first, in 1793, was by Christian Conrad Springel; but the subject received but little attention until thirty or forty years later, since which time many botanists have given the subject careful study.

Our most eminent botanists now classify flowering plants in their relation to fertilization into two classes, "*Anemophilous*" and "*Entomophilous*," literally, wind lovers and insect lovers. The flowers of plants fertilized by the wind are dull in color, and nearly or quite destitute of odor and honey. The sexes are frequently separated either on the same plant or on separate plants. They produce a superabundance of light, dry pollen, easily transported by the air or wind from one plant to another. Pines, firs and other conifera are familiar examples which sometimes fill a forest with "showers of sulphur" when shedding their pollen. Our nut bearing trees are examples among deciduous trees. I have been much

interested this spring in noticing the butternut trees which have blossomed very abundantly; how the staminate blossoms never mature on an individual tree at the same time as the pistilate blossoms, thus compelling cross-fertilization with some neighboring tree.

The grasses and grains are familiar to all. A kernel of corn will grow as well or better alone, than in a hill with several other plants, but "the ear will not fill" unless it receives the wind-wafted pollen from neighboring plants. On the other hand those plants that seem to require bees or other insects to carry pollen from one flower to another have showy blossoms with bright colors, or white, which are showy at dusk, or they give out either a strong perfume or abundance of nectar, or both. We find the pollen grains to be moist, or glutinous, or hairy, or otherwise, so constructed as to be easily transported by bees or other insects from flower to flower. In this class of plants or flowers many very ingenious arrangements are provided to secure cross-fertilization. One sex is found in one flower and the other sex in another on the same plant, as in the squash and melon families. In other species the sexes are found in separate plants, as the willows.

On some plants the pistils appear first and become fertile before the stamens ripen their pollen, in others their stamens shed their fertilizing dust before the stigma of the pistil is ready to receive it. The common red raspberry matures its pistils first so that, unless bees or other insects carry pollen to it from other earlier blossoms, the fruit will be imperfect. The partridge berry is very interesting. The flowers upon about one-half the plants produce their stamens first, the other half their pistils, while in a week or ten days the order is reversed.

Many flowers that invite insects appear to be capable of self fertilization and indeed often are, but the pollen from some neighboring plant seems more potent. Some flowers are so constructed and the stamens are so placed that their pollen can never fall upon the stigma of the same flower, but with special adaptation for the transporting of pollen from one flower to another by insects. One curious plant produces small inconspicous flowers early in spring, capable of self-fertilization; later in the season more

showy flowers that can only become fertile through the agency of insects.

Many plants remain constantly barren unless they receive the visits of insects. Many of my readers have doubtless observed how the fuschia or begonia never produces seed in a closed room; yet when set out of doors in summer they seed abundantly. Still other exotic plants never produce seed because the insects which feed upon their blossoms have not been imported with the plants. But this is a large subject and one of great interest, as we observe the many ways the Author of Nature has provided for the best good of all his works.

The stone fruits, although their blossoms seem perfect, appear to be almost if not quite incapable of self-fertilization, as is found by trying to ripen peaches under glass, success coming only when a hive of bees is introduced when the trees are in full bloom. The same appears to be true of many varieties of apples and pears. The Baldwin apple is known as one of the most productive varieties cultivated in New England, but some person supposing he could produce apples very abundantly by planting all Baldwins, when last heard from had met only with failure. Mr. H. A. March of Fidolgo, Wash. who raises cabbage and cauliflower seed by the ton, while on a visit East last summer told me that he kept bees almost exclusively for the purpose of increasing the quantity and quality of his seed.

But suppose it were true that all trees or plants which produce fruit or seed of value for the use of man could become fertile without the aid of bees or other insects, would it prove their aid of no value? Not at all; enough has been written to show that the Creator has planned for the cross-fertilization of plants, and wisely provided for it in a multitude of ways; and the chances of cross-fertilization appear to be as great in the vegetable as in the animal world, so that we might assume it to be valuable or necessary even if we could see no good reason for it. We all know that birds or domestic animals will prove fertile for one or perhaps several generations in spite of the intermarriage of near relations; but it is, I believe, the universal experionce that such unions are unwise and as a rule prove injurious.

Some twenty-five or thirty years ago Charles Darwin, in studying this subject and noting the many provisions of nature for the cross-fertilization of flowers, became so much interested in it that he began a large number of experiments to test the value of insects in cross-fertilization and the effects of cross and self-fertilization upon plants. His experiments were conducted with great care and continued through many years and his book of several hundred pages, giving the results of his experiments upon this subject, is very interesting reading in this connection to say the least.

Of some 125 plants experimented with, more than half were, when insects were excluded, either quite sterile, or produced less than one-half as much seed as when insects were allowed to visit them. In his catalogue of these plants I notice the red and white clover. His experiments with these turned out almost exactly like those conducted by Prof. Cook, late of Michigan Agricultural College. He says, page 361, of red clover "One hundred flower heads on a plant protected by a net did not produce a single seed, while one hundred on plants growing outside, which were visited by bees yielded 68 grains of weight; and as 80 seeds weighed two grains, the 100 heads must have yielded 2720 seeds." His experience with white clover was quite similar.

Another most interesting and important result of his experiments was that plants grown from seed from self-fertilized flowers were as a rule, when grown side by side with seed from cross-fertilized flowers, much less vigorous, although the two kinds were grown under conditions as near alike as it was possible to make them. On page 371 Darwin says, "The simple fact of the necessity in many cases of extraneous aid for the transporting of the pollen, and the many contrivances for this purpose, render it highly probable that some great benefit is thus gained; and this conclusion has now been firmly established by the superior growth, vigor, and fertility of plants of crossed parentage over those of self-fertilized parentage."

Many facts have come to light in this country during the last few years of great interest to fruit growers. The following from a government bulletin entitled *Insect Life*, by Frank Benton.

A case illustrating very clearly the value of bees in an orchard

has recently come to the notice of the writer, and its authenticity is confirmed by correspondence with the parties named, who are gentlemen of long and extensive experience in fruit growing, recognized in their locality as being authorities, particularly in regard to cherry culture. The facts are these: For several years the cherry crop of Vaca Valley, in Solano Co., Cal., has not been good, although it was formerly quite sure. The partial or complete failures have been attributed to north winds, chilling rains, and similar climatic conditions; but in the minds of Messrs. Bassford of Cherry Glen, these causes did not sufficiently account for all the cases of failure.

These gentlemen recollected that formerly, when the cherry crops were good, wild bees were very plentiful in the valley, and hence thought that perhaps the lack of fruit, since most of the bees had disappeared, might be due to imperfect distribution of the pollen of the blossoms. To test the matter they placed, therefore, several hives of bees in their orchard in 1890. The result was striking, for the Bassford orchard bore a good crop of cherries, while other growers in the valley who had no bees found their crops entire or partial failures. This year (1891) Messrs. Bassford had some sixty-five hives of bees in their orchard, and Mr. H. A. Bassford writes to the Entomologist: "Our crop was good this season, and we attribute it to the bees." And he adds further:

> Since we have been keeping bees our cherry crop has been much larger than formerly, while those orchards nearest us, five miles from here, where no bees are kept, have produced but light crops.

The *Vacaville Enterprise* said last spring, when referring to the result of the experiment for 1890:

> Other orchardists are watching this enterprise with great interest, and may conclude that, to succeed in cherry culture, a bee-hive and a cherry-orchard must be planted side by side.

And now that the result for 1891 is known, "Others," so Mr. Bassford writes, "who have cherry-orchards in the valley are procuring bees to effect the fertilization of the blossoms."

Some time since, Charles A. Green, the veteran fruit grower of Rochester, N. Y. and editor of "Green's Fruit Grower", wrote an editorial on this subject from which we extract.

Is the honey-bee beneficial or detrimental to fruit growers? This has been an open question for many years. It has been contended by some, erroneously, that bees puncture grapes, and other fruit when ripe, greatly to the injury of the fruit. At the same time, it has been noticed that bees frequent the berry-fields and the orchards in great numbers during the blossoming season. It was granted that, in a few cases, bees might be beneficial in fertilizing the blossoms, more particularly of the strawberry, which was known to be often pistillate.

It has now become demonstrated that many kinds of fruits, if not all kinds, are greatly benefited by the bees, and that a large portion of our fruit, such as the apple, pear, and particularly the plum, would be barren were it not for the helpful work of the honey-bee. This discovery is largely owing to Prof. Waite, of the Agricultural Department at Washington. Prof. Waite covered the blossoms of pears, apples, and plums, with netting, excluding the bees, and found that such protected blossoms of many varieties of apple and pear yielded no fruit. In some varieties there was no exception to the rule, and he was convinced that large orchards of Bartlett pears, planted distant from other varieties, would be utterly barren were it not for the work of the bees, and even they could not be profitably grown unless every third or fourth row in the orchard was planted to Clapp's Favorite, or some other variety that was capable of fertilizing the blossoms of the Bartlett.

In other words, he found that the Bartlett pear could no more fertilize its own blossoms than the Crescent strawberry. We have already learned that certain kinds of plums will not fertilize their own blossoms, such as the Wild Goose, etc.

C. J. Berry, Horticultural Commissioner for Tulare Co., Cal., who has several hundred acres of orchards, wrote some pithy paragraphs some time since for the *American Bee Journal*. He says:

"Bees and fruit go together. I can't raise fruit without bees. Some of the other cranks say I'm a crank, but I notice there is a pretty good following after me, hereabouts, and they keep a-comin'.

Yes, sir, 'ee, I have bees all about my big orchard. *Two years in succession I have put netting over some limbs of trees; and,*

*while they blossomed all right, no fruit; while on the same tree, where limbs were exposed to the aid of bees, plenty of fruit."*

In the Province of Ontario the relation of bees to fruit has been very fully discussed in *Gleanings in Bee Culture.* Mr. Allen Tringle gives a graphic account of this discussion as follows:

In the spring of 1892 I was summoned to appear before a legislative committee of the House of Assembly of Ontario, at Toronto, to give evidence as to the effects on the apiarian industry of spraying fruit-trees, while in bloom, with Paris green, and other poisons. Our Ontario Bee-keepers' Association had moved for an act to prohibit the spraying while the trees were in bloom, as the bees were being poisoned in various places, and the spraying at such a time was unneccessary, and indeed, injurious to the fruit, as well as poisonous to the bees. The Minister of Agriculture, for the enlightenment and guidance of the legislative committee in a matter so important, where the interests of the apiarists and horticulturists were alike involved, had summoned the leading men in both industries in the province to appear before the committee to present the facts, the experiences, the pros and cons of both sides. The scientists were also summoned from Ottawa and Guellph—Dominion and Provincial entomologists—to speak for science. The questions of spraying, fertilization, etc., were discussed. The horticulturists, with one single exception, admitted the valuable and indispensable offices performed by the honey-bee in the fertilization of the fruit-bloom; and this was corroborated and confirmed by the entomologists. The fruit-growers agreed that "The bees play a very important part in cross-fertilization, and, therefore, should not be destroyed;" that "We are very generally dependent upon insects for the fertilization of our orchards. To destroy them to any extent would be very injurious to fruit growers."

Prof. James Fletcher, Dominion Entomologist, said: "Bees do not visit fruit-bloom in dull weather, and then we get little fruit in consequence." It may be well to quote Prof. Fletcher here on a cognate point also, as being a high authority. He said: "As to bees injuring fruit, there is no direct evidence. Wasps may start the work, and then bees continue it. We have never been able to

find a case of primary injury *by bees.*" (See official report of meeting.)

The consensus of the meeting was, that "Bee-keepers and fruit-growers are of great help to each other, and even indispensable, if each class is to obtain the best results in their work."

The act we sought of the Legislature became law in this Province, as follows: "No person, in spraying or sprinkling fruit-trees, during the period within which such trees are in full bloom, shall use or cause to be used any mixture containing Paris green or any other poisonous substance *injurious to bees.*"

Perhaps no one in this country has given this subject more carful thought or experimented more fully than Prof. Cook so long Professor of the Michigan Agricultural College. He says:

"Now that spraying our fruit-trees with the arsenites early in the spring, is known to be so profitable, and is coming and will continue to come more generally into use, and as such spraying is fatal to the bees if performed during the time of bloom, and not only fatal to the imago, but to the brood to which it is fed in the hive, it becomes a question of momentous importance that *all* should know that bees are valuable to the fruit-grower and the apiarist alike, and that the pomologist who poisons the bees is surely killing the goose that lays the golden egg. That bees are easily poisoned by applying spray to trees that bear nectar-secreting blossoms, at the time of bloom, can be easily demonstrated by any one in a very short period of time. It has been demonstrated in a frightfully expensive manner in several apiaries in various parts of the country. Several bee keepers, whose all was invested in bees, have lost this property, all because some fruit-growing neighbor either thoughtlessly or ignorantly sprayed his fruit-trees while in bloom; and this in the face of the fact that, for the best results, even in the direction sought, the spraying should be deferred until the blossoms fall. I have demonstrated this fact, where the results were entirely in sight. I have shut bees in a cage, and given them sweetened water, containing London purple in the proportion of one pound to 200 gallons of water, and in 24 hours the bees were all dead; while other bees, in precisely similar

cages, and fed precisely the same food, with the poison omitted, lived for many days.

We thus see that it becomes very important that pomologist and bee-keeper alike know the danger, and also know the loss to both parties in case caution is not observed to avoid the danger and probable loss. It is also important that, by definite experimentation, we learn just how important the bees are in the pollenization of plants. To determine this point, I tried many experiments last spring. I counted the blossoms on each of two branches, or plants, of apple, cherry, pear, strawberry, raspberry, and clover. One of these, in case of each fruit or each experiment, was surrounded by cheese-cloth just before the blossoms opened and kept covered until the blossoms fell off. The apple, pear, and cherry, were covered May 4th, and uncovered May 19th and 25th. The number of blossoms considered varied from 32, the smallest number, to 300, the largest. The trees were examined June 11th, to see what proportion of the fruit had set. The per cent. of blossoms which developed on the covered trees was a little over 2, while almost 20 per cent. of the *uncovered* blossoms had developed. Of the pears, not one of the covered developed, while 5 per cent. of the uncovered developed fruit. Of the cherries, 3 per cent. only of the covered developed, while 40 per cent. of the uncovered blossoms set their fruit. The strawberries were covered May 18th, and uncovered June 16th. The number of blossoms in each experiment varied from 60 in the least to 212 in the greatest. In these cases, a box covered with cheese-cloth surrounded the plants. The plants were examined June 22d. Eleven per cent. of the covered blossoms, and 17 per cent. of the uncovered had developed. To show the details, in one case 60 blossoms were considered, 9 of which in the covered lot, and 27 in the uncovered, had developed; that is, three times as many flowers had set in the uncovered as in the covered. In another case of 212 blossoms the fruit numbered 80 and 104.

In case of strawberries, our experiments this year, like some previously tried, seemed to show that the presence of insects, though important to a maximum production, are not so necessary as in case of nearly all other fruits. But we must remember that

the strawberry plants are not wholly inclosed. A cloth-covered box rests on the ground about the plant. This gives a fine chance for insects that burrow in the earth, and for insects that have pupated in like position to come up during the three or four weeks of the experiment, and pollenize the blossoms. This though a possible, and (shall I say) a probable explanation, may not be the real one. But we can still affirm, in case of the stawberry, that the free visits of insects serve surely to much enlarge the production of fruit."

Thus we see that our horticulturists and farmers alike, with the apiarist, are dependent for the best prosperity on the presence and well-being of the bees. They should realize this fact, and should demand that our legislators not only become informed, but act accordingly.

These somewhat lengthy extracts are taken from a symposium upon this subject published by A. I. Root of Medina, Ohio, to which the reader is referred should he wish to investigate the subject further.

# CHEESE.

## DORSET INSTITUTE.

Prof. James Cheesman of Southboro, Mass., read the following paper on

### THE CHEESE INDUSTRY.

In these last days of the century every manufacturer who uses physical and chemical forces in his processes must carefully weigh and measure his raw material, and know the relative quality of the several ingredients which constitute his manufactured product. Hence the dairyman finds that reliable weights and measures are necessary to a correct estimate of value. The maker of textile fabrics sells his products at a price which is governed by the relative amounts of cotton and wool of which they are composed. For a long time the owners of good cows refused to pool interests in the milk vat of the cheese factory because no way was known by which each man could get what belonged to him. The owner of the little cow protested that he could not afford to give part of his earnings to the owner of large animals giving much milk. The man with the large cow was satisfied with an average, since he had been taught that about ten pounds of milk ought to make one pound of cheese. This contention, and the absence of weights and measures to settle the dispute, encouraged the majority to keep large cattle giving a deep flow of milk, as that was the type of "cheese cow." Keeping big cows increased, and soon farmers began to learn that ten pounds of big cow's milk would not make the pound of cheese. Besides, the large cows cost more to keep; in other words, a fifty-acre pasture would not work out as well with big cattle as with moderate sized ones. Who could decide the disputes involved, and how could the farmer get his judgment right on the questions, "What cow shall I keep?" and "How can I find out whose milk makes the most cheese, and what causes the best kind of cheese?"

All these questions have been met by farmers, and answered in duplicate during the past three years by cheese factories and experiment stations. The butter fat test by Babcock's machine has been the alpha and omega of the modern dairyman. It is just, gives even measure, cheats no one, and pays each man just what he has earned. This test has been applied in every variety of way, so that no one who knows it now thinks of disputing the equity of its work. No one who is paid for milk according to this plan has any interest either in skimming or watering, so that the double result is that an untampered milk is now delivered, while the improvement in the grade of the cattle has put up the fat content of the milk several points.

Practically if each patron's product could be made separately it would be found that the very small loss of fat in the whey due to using extra rich milk of quality above 5 per cent. of fat, would be more than compensated in the higher quality of the goods and their increased value. We may take it for granted that very few cheese factories will ever get their average above 4.5 per cent. throughout the season, so we need not speculate on losses which are not likely to happen.

Whether this plan is adopted this year or not makes no difference because sooner or later it must be. All the creameries making separate cream butter have to use it, and the gathered cream factories can't do without it. Without it we shall not see any great improvement in dairy cattle in cheese districts. The sooner it is adopted the better it will be for every patron. In less than two years farmers will know the earning power of every cow in his barn. He won't be content to learn that the income of the herd depends entirely on the yield of butter fat, without wishing and trying to learn how cheaply one cow can produce against another.

To start right is to begin with the cow, and to understand her in detail more definitely than we do now. Haphazard must give place to weights and measures—guess to calculation.

Having got our milk as good as we can, and at the lowest cost to the factory scale, we dump it into the vat. Before going further I must not assume that every one agrees to this plan of scale. There is a simple remedy for the difference and we need not break

down the factory or have any one discontented. If we have five or six thousand pounds of milk per day we can group all the patrons who want to sell butter fat into one vat, and those who prefer the present system into another. Three or four months of this will settle the matter for every patron. Group No. 1 will earn more per hundred pounds than group No. 2. The maker can easily satisfy himself by sampling his milk from day to day which is the most economical. Of course it means a little more work for the maker. Whether this plan is adopted or not every cheese factory in America might change some details in their present practice.

Some one who is not familiar with the working of the fat test for cheesemaking purposes may ask, why limit the estimate of value to one constituent of milk when several are found in the manufactured cheese? For three seasons, those who have tried this method are as satisfied with it as the farmers who sell milk for butter making. The plan is simple; every morning a sample of milk is taken with a tube made for the purpose at the rate of one-sixteenth or one-eighth of an ounce or whatever quantity is convenient and agreed upon for every ten pounds delivered. The same is gathered into a pint jar which is numbered. If a man brings 70 pounds of milk, seven-eights of an ounce will be taken. If another man brings one morning 115 pounds of milk, a sample of one and seven-sixteenths of an ounce is taken. If the following day it is increased to 160 pounds, then two ounces are taken. These samples are mixed from day to day for one week, and at the end of the week the composite samples, as they are called, are tested for their percentage of butter fat.

Each patron is credited with the total number of pounds of butter fat delivered every week, and at the end of the month the total amount of cheese made is sold.

Now we will suppose the patrons have delivered in four weeks 120,000 pounds of milk containing 4 per cent. of butter fat, or 4,800 pounds. If this has produced two and seven-tenths pounds of cheese for every pound of fat we shall have 12,960 pounds. Ten cents per pound is $1,296, or equal to 27 cents per pound for fat, or equal to 21.6 cents per pound of commercial butter from which we deduct making charges. If divided on the milk pool plan every

man would get $1.08 per hundred without taking out the expenses. Now how does this work? One man has five cows which produce 100 pounds of milk a day containing 4.5 per cent. fat. On the butter fat basis his earnings will be at the rate of $1.21½ per hundred. Another man delivers 200 pounds of milk a day from eight cows containing 3.8 per cent. fat. His earnings are $1.26 per hundred. A third man keeps twelve large cows which produce an average of 40 pounds a day or 480 pounds. The milk contains 3.2 per cent. of fat and earns only 86 cents per 100 pounds from which expenses are deducted. The question will be asked is this just? The only reply is that if any unfairness exists it is against the man who delivers the best milk.

As a rule the man who makes the best cheese consumes the most time. Instead of trying to keep pace with the clock, it must hereafter be only a dairy implement to measure the progress of each stage of the work. The skilled maker who wants to improve and guard the reputation of the factory product tries rather to keep pace with his milk, and to follow the working of maturity and the progress of his curd, allowing the clock to aid only.

Having been in the business long enough to get experience he should have the trained eye, nose, palate, touch and judgment, without which no amount of book knowledge or other equipment will fit him for the make-room. The first thing every maker should aim at is tested thermometers. Every factory should have a standard thermometer for the sole purpose of testing ordinary thermometers in use. A good one need cost but $4. Thermometers should be bought by the hundred with a guarantee, then the factory could sell them to the farmers at a fraction over cost.

With a correct thermometer the maker may start in with his vat without fear of mistaken temperatures. He will not be in danger of working too rapidly through setting his milk too soon because his thermometer indicated several degrees higher temperature than he really had, nor will he set his milk at too high a temperature because the mercury does not rise high enough in the scale.

If you want uniform cheese from day to day, and want to be independent of weather you must know the conditions of your milk by some test which will be more accurate than your eye, nose or

taste. This test has done much for the cheese-maker during the last ten years. The test as used by the majority of makers is simply a teacup of the milk treated with a teaspoonful of rennet of known strength. If coagulation begins in 20 seconds, add your rennet. If not less than 50 seconds, or a minute, carry the milk along until mature. In Wisconsin 20 ounces of milk are used at 86 deg. and one drachm of rennet extract. If the milk is good, it is set when the sample coagulates in 60 seconds.

If the milk is tainted, the work is hurried. Be sure you use a pure standard extract, free from artificial acids. Recently the more careful of the best known makers are using Monrad's arrangement of the test, which is the most accurate and the best aid to the judgment. This requires a few things, as follow: A pipette and measuring flask to hold 50 cubic centimeters. Take five cubic centimeters of rennet extract and deliver into 50 cubic centimeters of pure water. Of this one-tenth normal solution, take a five cubic centimeter measure and add to 160 cubic centimeters of milk or just about five and three-eighths of an ounce. This test is based on 120 seconds calculation, and is safer than either of the others.

If your factory receives the milk of fresh cows in spring as it probably does, the months of September and October will require more care and judgment in nursing the milk; and you will have to keep the work room snug and warm, not less than 70 deg., if convenient. A cheese factory ought to be regarded like a nursery for young babies and the curing room should be treated as if it were a hospital ward for convalescents.

After we have the curd ready to cut it will break clean over the finger. How fine you should cut will depend on the kind of cheese you make. The chief point is to cut carefully and uniformly, so that as little waste as possible shall result from loss of fat and caseine. After cutting give your curd time to firm, and let the surface of the cubes glaze over thoroughly before commencing to stir. When you begin to stir, raise the temperature slowly to 96 deg., not more than one degree in four minutes. This will require one hour's time, less or more. As soon as the cubes respond to the warmer whey by contraction, commence to draw off a third for greater convenience in working. Skill and judgment in this part

of your work will determine the quality and quantity of the yield. When you have drawn off the last of the whey, stir constantly, and thoroughly air until your curd reaches the condition you aim at. In working on the stirred curd process, as many cheese-makers do, the work is done in very much less time than the cheddar, and a moister cheese results. As much of our cheese is put on the market in from three to six weeks from the cheese press, through the summer season, we want to consider this subject of moisture in a little more detail.

We must use enough rennet to hasten the curing by the time we want to use the cheese, and yet not enough to render our cheese too dry. Use enough rennet to coagulate your milk in 10 minutes, during that part of the season when cheese is sold a month or five weeks old, and in the fall when your make is not likely to be eaten for from four to six months, use less, or enough to coagulate the milk in from 16 to 20 minutes. If the curd does not work as fast as you wish take longer to mature it at 98 deg., rather than risk a higher temperature. The richer the milk the greater the risk of waste, and the danger of weakening the rennet is always increased when you resort to higher temperatures. Be sure of your temperature.

Before grinding let the curd cool to 75 deg. or you will start the fat leaking and lose substance and quality. Some makers do not use a curd mill, but contrive to keep the curd divided by the vigorous stirring practiced.

The salting of curd must be governed by several considerations. In the early spring, stall fed cows produce milk that is sluggish. This requires skill all through the stages to deal with. It is usual to salt this at the rate of only two pounds or less of salt per thousand pounds of milk. A better rule, it seems to me, is to make the quantity of fat in the milk the rule, and say from three-quarters of an ounce to one and an eighth of an ounce of salt per pound of fat. If the milk contains 4 per cent. of fat, use three-quarters of an ounce, or thirteen-sixteenths.

The following table will show the relation of this rule to the old one on a basis of 4 per cent. of fat: Multiply your number of pounds of fat, in the milk by the quantity of salt used per pound of fat and the result will be the total salt wanted.

Three-fourths of an ounce for 4 per cent. milk is thirty ounces of salt per thousand of milk, and every additional eighth of an ounce is five ounces extra; a division of sixteenths would be a difference of two and one-half ounces of salt per thousand. Salt is a flavor and an antiseptic. Its action is to check the too rapid work of the acid and rennet and to retain the moisture in the cheese. As the season advances it will be necessary to increase the amount of salt up to one ounce or more, as circumstances suggest. In the fall seven-eighths to one ounce and an eighth may be used, according to the length of time the cheese is to be kept. Use the best salt. Having stirred in the salt let it rest for a few minutes until the curd has begun to absorb it. If the make-room is comfortably warm, not less than 73 degrees, don't hurry with the hoops. Let it lie for at least thirty minutes spread out with as much surface as possible. Measure out the curd carefully by weight to the quantity which you require to make your particular size and style of cheese. Apply your pressure gently, and be sure you don't start the white whey, which means a loss of fat.

I leave the other minor details and go to the curing room, which in the coming year will witness more skill than we have been accustomed to in days gone by. In many cases buyers of the home trade cheese often finish the curing themselves rather than risk the goods in the insecure sheds and rooms which do duty for curing rooms. For new cheese, especially in spring and fall, never allow the room to fall below 65 degrees at any time. Curing rooms should be so constructed or adapted as to be on the ground floor, and be divided into at least two compartments. A room properly constructed, with shelves in tiers of three, will have strata of air of three temperatures, the top one being the warmest. This plan will enable the owner to use the upper shelves as a drying department for the first few days. As the cheese progresses it should be brought to lower levels and to cooler parts of the room where the temperature won't exceed 65. For long keeping goods it is desirable to have the second chamber at a temperature of 58 to 65.

In this room care should be taken to control the moisture of the atmosphere by using a hygrometer. The use of a hygrometer will often make a difference of 5 or more per cent. in the moisture

of the cheese. The loss of this amount not only means a dryer and harder cheese, but it prevents cheese curing up as mellow as it would otherwise, reduces its value and entails loss of weight.

Within five years a number of varieties of fancy cheese have come upon our market. One of the best known of these, and perhaps the most successful, because it suits the American demand for a mild, marrowy, mellow cheese, is a jar of two pounds. It sells for a long price. This cheese has had several imitators, and within the last two years a Vermont-made cheese has been bought for a western concern in Ohio, 700 miles away, to be repacked in glass jars and freighted back to the East to retail at fifty cents a pound. In the coming year I expect to see many imitations of these cheeses. What is wanted is a mildly cured cheese ready for market in about four months. When you have that cheese, the problem is to divide it up into small enough quantities and pack it so that it will keep as long as six or eight weeks and have it air tight and cool. A great prize awaits the man who can do it.

If cheese can be so popularized with the masses of the people as to induce them to pay cheerfully from 16 to 20 cents for an article which they can spread like butter—then good-bye to "oleo and all dairy imitations." Fine cheese is more economical than pepsin or alum butter, and its greater food value is not to be compared with the vile compounds of imitations.

The time is coming when all the cheese factories in a given district, say within fifty miles of a common center, will have to be under the management of a single business executive. The make of cheese should be entirely controlled in this way for the best business results. The best and cheapest supplies are used, the best business talent is at command for the sale of cheese in the markets which will realize the highest return on the goods. The tendency of the times is to narrow down cost, to reduce the rate of profit on merchants' sales, and to sell the consumer the largest value at the lowest price. These conditions can only be fully realized in the largest undertakings. Small businesses are apt to be expanded into larger ones.

Success in any manufacturing enterprise in all parts of the world depends on proper organization and efficient direction. A

large output, intelligent labor, high wages, and low cost must go together. Comprehensive knowledge of every quality of the raw material and ability to secure it in the highest possible condition before manufacturing are prerequisites to a choice article.

When farmers are fully alive to their own interests they will co-operate to guarantee the raw material. The amount of goods they can produce, the confidence they repose in each other and the business quality of the organization will alone limit the immense possibilities of the cheese industry.

## CORN AND THE SILO.

### MARSHFIELD INSTITUTE.

Mr. Gabrilson, of Iowa—We of the West are successful, as we follow your Eastern ways. We were forced into dairying when our fields refused to yield us the great crops of wheat they formerly gave us, and we took up dairying as our only hope of success. We in Iowa have to care for our cows as carefully as do you in Vermont—only we as a rule feed grain of our own raising. The use of cotton-seed, linseed, and gluten, as you use it is wholly new to us, in some, at least, of the Western States. The introduction of dairying has changed the conditions in many sections from abject poverty to a condition of comfort. The time was when we feared an overproduction of butter, but we no longer fear it, and we feel now that good butter will always be wanted at a good price, and nowhere in the country do we for a moment fear an overproduction of good butter. In feeding, we depend largely on what we grow on our farms, and corn is our principal crop. Iowa raised last year over 350,000,000 bushels of corn. Silaging is not as largely practiced in Iowa as it should be, but where it has been adopted it is very popular. Clover has become a grand crop with us, as it is with you, and we are growing more and more.

Mr. Sanford—What is the average yield of your cows?

Mr. Gabrilson—I think it is about 155 pounds per cow.

Mr. Sanford—How much corn do you get per acre?

Mr. Gabrilson—About 45 bushels per acre.

Mr. Sanford—How much corn land will a man tend?

Mr. Gabrilson—About 40 acres to a man.

### ORWELL INSTITUTE.

Mr. Arms:—This morning, before the meeting opened, I was introduced to some of Orwell's bright, progressive farmers, and knowing I was to discuss this question, and that for the first time during my connection with the State Board, I naturally looked for

some local help, and felt my way a bit to see if the subject was one that would interest your people. One of my first queries was —"Are silos quite common in Orwell"—and you may imagine my surprise when the reply came—"Not one silo in town." I was quite taken aback, and the gentlemanly landlord kindly helped me out in this way: "Orwell raises such good crops, we don't need to rot it to feed it out." Now this gave me a text for the short address to which I will ask you to kindly give your attention.

Years ago it was the habit of the then new idea farmer to spend a small fortune in building of brick, stone, cement and several thicknesses of paper and lumber, a silo, or cellar for the storage of a crop of green corn fodder grown from a later variety of western or southern red cob corn, often cut before it was ripe enough to have attained its best condition and full nutrition value. To-day the silos of Vermont are built of a slight thickness of matched sheathing, at a much less expense, and the crop grown is being matured and put in the silo in its best possible condition, either entire, or often plucking the ripened ears, which are husked and cribbed for grinding. In 1891, Prof. Robertson, the Dairy Commissioner for Canada, gave me this advice: "In building a silo, remember one thickness of boards, if well seasoned and matched, is better than a double boarding, and will last longer, as it will dry through and not rot out. Don't put more than 75 per cent. of water in your silo."

In building in a barn, it is necessary to make your sides strong enough to withstand a considerable lateral pressure. Studding 2x6 inches should be put in about 16 inches apart, and upright. Fix your corners firmly to avoid their giving out by the pressure; nail your matched sheathing on horizontally, having every board sound, or at least free from loose knots; lumber well seasoned or kiln dried, and it is advisable to fill your corners with a three-cornered timber, say take a 6x6 inch or 8x8 inch timber and cut it cornerwise and nail it in the corners to make it easier to pack your silage in closely. Then paint the inside with some cheap tar paint, and you will have no difficulty in keeping your ensilage perfectly good and palatable for your stock.

Question—How do you fix the bottom? I would advise, if on

a moist ground as is my own, filling in the bottom with a few inches of stone, covering them with gravel, and covering the gravel with cement, so making a bottom that rats and mice could not burrow through, and excluding the air. It is my custom to put in a good layer of straw at the bottom and in removing the silage in the late spring the silage is good all the way down. The past two winters have given us as cold weather in Vermont as we ever knew, yet the single thickness of sheathing, dressed to seven-eight inch and matched, has kept my own silage free from frost and it has given me entire satisfaction. In fact, I would not know how to manage a winter dairy without a winter silo. My own practice is to pluck the ears, after they are ripe enough to crib, and use the stalks from my field corn for silage, and I consider it the best way for me, though many people prefer putting in ears and all, and if only dairy cows are kept on a farm it might be the best plan to silage the entire crop. In planting use about eight quarts of seed corn to the acre, and plant as for a grain crop. Let the sun shine in to ripen your corn and if cut when ripe enough to stook, as for husking, it is all the better to let it lie in the garret and wilt a day or two before cutting into the silo, as you will have a plenty of water then left to give you all the fermentation needed to make good silage.

Question as to cost of harvesting—It is our cheapest way of securing the crop and gives us a sweet, succulent food for our cows, or other stock, during the winter, which is a great advantage to them. As everyone knows, a variety of food is desirable. Plant the largest variety you can ripen, and in cutting it remember the best point of the stalk is that which grows nearest to the ground, so cut your corn close to the ground and secure all the food there is in the stalk. Cattle will eat it all, and in no other way, unless it be by the expensive mode of steaming, can you get so much food from an acre of corn as by the use of a silo, whether you use it for storing your stover or put it all in.

Question—If put in entire would you ripen it as much as if you husked it? No. I would cut it when in the roasting stage, or when it has just begun to glaze. It is believed to have all its nutri-

tious value at that stage of ripeness. Twelve or eighteen tons of silage can be grown on an acre, and three tons of good corn silage are considered equivalent to a ton of the best hay. Let me urge you to at least try a silo and you may be sure you will not regret it, for the silo has come to stay.

Question—What is the cost of a silo to hold one hundred tons?

Mine holds over one hundred and fifty tons and cost about one hundred dollars.

Mr. Sanford—In building a silo it is important that the corners be securely fastened to resist the pressure. In filling, be careful to pack the sides and corners. My opinion is that it pays to raise corn, and that the most profitable and cheapest way to harvest and feed is through the silo.

# THE VALUE OF CORN STALKS.

BY HENRY E. ALVORD, OF VIRGINIA.

EAST BETHEL INSTITUTE.

The statement is made that the farmers in the states of Maine, New Hampshire, and Vermont, annually purchase and use about four million bushels of Western corn, at a cost of at least two and a half million dollars. This is surprising and challenges attention. If true, it may well be doubted whether such purchases can be approved on sound principles of farm economy. It may be asserted that, as a rule, it may be true economy to buy largely of concentrated feeding stuffs of a highly nitrogenous character and having a high value in adding to the fertility of the farms on which they are consumed. Correspondingly, it may be laid down as correct in principle that farmers should grow at home, most, if not all, of the carbonaceous foods which they use. Corn belongs to this class, and these facts seem to be a sufficient cause for presenting at this time some reasons why New England farmers should grow more corn.

There is no excuse needed, however, for discussing this question at any agricultural meeting in this country. Maize, the Indian corn plant, is ever a fit subject for study. Corn is everywhere in America, grown upon almost every farm. It is the great agricultural plant of the continent, the truly typical farm plant of America. Always useful and well appreciated on the farm, the sphere of usefulness of corn is fast extending, and there are new lessons to be constantly learned of its value.

More than half of the Agricultural Experiment Stations of this country have very properly made studies of the corn plant. Some have been working on this line for five or six years. It is time, now, that the results of this work should be gathered together, and the most important practical lessons to be derived should be formulated. I want to do this in a measure, at the present time, giv-

ing as concisely as possible some of the important practical results of this work. Without stopping to refer to my authorities, as I proceed, it may be now mentioned that the statements made are sustained by published reports from the Stations in Maine, New Jersey, Pennsylvania, Maryland and Illinois.

The first reason why more corn should be grown is, that an acre of average farm land will yield a greater crop of corn than of any other forage crop. Corn will do well on almost any soil, while there is much land that will not produce well of hay and grain and roots. Grown for fodder, a green corn crop of 16 to 20 tons is not unusual, and 25 tons are produced sometimes. As a field cured crop 5 to 8 tons may be obtained and occasionally 10 tons. But for comparison with other crops for forage, I find it convenient to take much lower figures, being a record of five years of field corn, raised for both grain and stover, which averaged a little over three tons per acre of field cured crop. Let us now refer to the first column in Table No. I for comparison of tonnage per acre.

TABLE NO. I.

*Comparison of Corn with other Forage Crops.*

| Plant or Part of Plant. | Crop per Acre. Av. 5 yrs. | Part or per cent. of total crops. | Food Yield. Field Cured Dry Matter in lbs. | Per cent. of the Dry Matter Digestible. | Yield per acre of Digestible Matter. lbs. |
|---|---|---|---|---|---|
| Mixed Hay... | 4000 | .... | .... | 51.3 | 1772 |
| Clover..... | 4000 | .... | 3496 | 52.5 | 1836 |
| Timothy ..... | 4000 | .... | 3556 | 53.0 | 1892 |
| The Corn Crop | 6172 | 100. | 4584 | 69.0 | 3172 |
| Corn Ears .... | 2556 | 43. | 2013 | 76.0 | 1530 |
| Corn Stalks... | 3516 | 57. | 2571 | 62.0 | 1642 |
| Corn Blades .. | 332 | 5.4 | 306 | 64.5 | 197 |
| Corn Tops .... | 936 | 15.2 | 819 | 55.0 | 450 |
| Corn Husks... | 642 | 10.4 | 591 | 72.0 | 426 |
| Corn Butts. .. | 1606 | 26. | 855 | 66.5 | 568 |

The land which produced this average corn crop of 6172 pounds was capable of yielding about two tons of clover, timothy or mixed hay, in a favorable season, but not more.

It is not the gross weight which should measure the yield of crops, however, in determining the food obtained from an acre. The actual dry matter in the field cured crop is more important, and this is given in the third column of the table. Here, again, it appears that the corn crop yields much more per acre than the others named. But we need to go a step farther. First ascertain the weight of the crop of field cured; then the weight of dry food material in the crop, and now we want to know how much of this is actual food, made available by the animal in the process of digestion. Numerous careful and interesting feeding and digestion experiments have given us the fourth column of figures, which is in some respects surprising. The corn crop as a whole, is found to be over thirty per cent. more digestible than clover, timothy or mixed hay. The last column can now be computed from the others and we find that of actual digestible matter, the corn acre yields nearly twice as much as the other crops. These facts could be verified by even stronger figures taken from other experiments. In one instance, clover averaged in four years, 2,257 pounds of digestible material per acre, while corn, a field crop for grain and stover, produced 4,248 pounds of digestible matter, and grown as fodder corn, 4,413 pounds of digestible matter per acre.

As to quantity of crop and food produced, the statement is therefore entirely correct, that in an acre of corn there is often twice as much digestible, nutritious material as can be obtained from an acre of mixed hay, timothy or clover. (Were it desirable, a number of other forage crops might be included in this comparison, with like results.)

It has been found, however, that the greatest quantity of available food does not accompany the greatest weight of crop. Maturity of the corn plant is essential to obtaining the most food value per acre. This important point is shown by the figures in Table No. II, the reliable results of experimental inquiry.

TABLE NO. II.

*Maturity of Corn and its Food Product.*

| Crop per acre. | Ears Silking. | Ears Glazing. | Ears. Ripe. |
|---|---|---|---|
| Green crop lbs. | 15232 | 16013 | 12103 |
| Field cured lbs. | 2987 | 4053 | 5675 |
| Digestible matter lbs. | 1978 | 2869 | 4024 |

This valuable work shows the remarkable changes and the rapid gain in food material during the short maturing season of the corn crop. In a period usually less than a month, the corn crop, while losing one-fourth of its gross green weight, more than doubles its field cured product and the digestible material which this contains. The gain in digestible matter during the final, short, ripening period is especially notable. By ripeness is meant that stage at which the plant has begun to dry, the blades below the ears and the outer husks having become brown and brittle.

The practical lesson to be derived from these facts is to postpone harvesting the corn crop until full maturity is secured. Even if this appears to cause a considerable loss of the blades, the delay is still to be recommended, the gain in food far exceeding all such loss. And if, by waiting for maturity, the crop is caught by frost, the injury is imaginary rather than real. If the ears have reached the glazed stage of the kernel, frost will not hurt the feeding value of the crop. Even a hard freeze does not impair the forage, if it is soon after harvested and preserved in a silo.

Attention is now asked to the lower part of Table No. I, where the different parts of the corn plant are compared, as I want particularly to show the value of corn stalks. The division of the corn crop into parts will be readily understood. First, the ears and the remaining stalks or stover are separated and then the stalks are divided into four familiar parts, the leaves or blades, (stripped from the stalks, below the ears) the tops, or top-fodder (cut off above the upper ear) the husks or shucks, and the butts, or main stem, with ears, tops and blades removed.

Comparing the corn ears and the stover, or entire stalks (including husks), it will be first noted that the latter considerably exceeds the former in gross weight, and in the absolutely dry matter of the field-cured crop. The ears (grain and cobs) are, of course, digestible in larger proportion than the rest of the plant, yet we see that the corn stalks of an acre yield a good deal more actual digestible material than the corn ears. This fact should not be forgotten—excepting only the smallest varieties of Northern corn, there is more stock food in the stover or stalks of a corn crop, than in the ears. A table might be added giving similar comparisons on the

basis of chemical composition; the figures of such a table, the accuracy of which cannot be disputed, show the food elements in corn grain, and in corn stalks to be alike and in much the same proportions. The grain, or fruit of the plant, appears to be the plant itself in a condensed form. This somewhat novel statement of the comparative food value of corn and corn stalks may be accepted as proved by the investigations referred to.

Two pounds of stalks or fodder, contain as much digestible food as one pound of ears, or cob-meal, and two and one-half pounds of stalks contain as much actual food as one pound of clear corn meal. These comparisons involve the points of quantity and kind of forage; the crop of stalks on an acre has as many (or more) pounds of actual food material as the crop of ears, and the food in the stalks is of such kind or character as to be worth about half as much as the ears.

Next, the different parts of the stalk may be compared with one another and with the whole stalk. (See Table No. I.) The relative weight of the different parts is of interest. The blades, often highly prized, constitute less than one-tenth of the whole, while the butts and husks together, both often wasted, comprise two-thirds of the stover. In the dry matter, the butts are one-third of the whole, and the butts and husks together are over one-half. The digestibility columns are of most interest. These show the husks to be the most digestible part of the stalks and the much-despised butts stand next, more digestible than tops or blades. There is more digestible matter in the butts on an acre than in any of the other parts of the stover, and with the husks they make nearly two-thirds of the food of the stalks. Every part of the corn-stalk examined is more digestible than timothy or clover. Compared on a chemical basis the same relations are shown. It thus appears that the different parts of the corn stalk are substantially of equal food value, pound for pound. What shall be said of the practical farming by which there is special exertion to save 332 lbs. of blade fodder containing 197 lbs. of digestible matter, while the butts are allowed to waste, although they contain 569 lbs. of digestible matter just as good? It is evident that one may leave his corn-crop in the field, to secure full maturity and even if all the

blades are lost and some of the top fodder, there will still be a net gain of half a ton of actual food material, in the average crop.

In ordinary farm practice, there is an almost entire loss of the butts of the stalks. In some parts of the country the prevailing methods of harvesting the crop include the actual abandonment of the butts, and sometimes the husks, in the field. In other sections, where the whole stalks are saved with more or less care, the system of feeding involves the loss of the butts. A large part of the stover seems to be often regarded as better for manure than for fodder. This waste of a large part of the stalks in one way or another, is observable wherever corn is abundantly grown. The waste is usually very great and is well worthy of close study. Economy in feeding is synonymous with profitable feeding. The fact of the enormous waste, in the aggregate, in these abandoned or neglected parts of the stover, must be recognized. And enough proof has been given of the true value of these wasted parts.

It may be said that animals do not relish the parts wasted, that they give preference in feeding, to the blades and tops over the husks and butts. This however is not a matter of food or nutriment but of edibility. It is all a question of mechanical condition, as can be very simply proved. Take ten pounds of nicely cured corn blades and an equal weight of the naked butts of the stalks. Keeping the two lots separate, cut short in a fodder cutter, and then run through a hand spice-mill, two or three times if needed. The result will be two lots of meal, alike in mechanical condition and substantially the same in chemical composition and food value. Animals will, in this form, eat the butts as readily as the blades, and will actually digest more of the former. [Note—A sample of "corn-stalk meal" was shown, made from weather-worn butts gathered in a field the spring following the harvesting of the crop. This was shown to be a good article of feeding-stuff, comparing favorably with wheat middlings and buck-wheat flour, in its appearance and taste.]

The main facts are beyond dispute. A large part of the corn crop in all parts of the country is annually wasted; this waste in the aggregate is enormous; the material thus wasted is good food material; the food value is there; it is a waste of food. The im-

portant question is, can this loss or waste be avoided? Can the food material which certainly exists in the portion of the corn plant so often rejected or wasted, be utilized so as to be made available to farm stock, in any practical, economical way?

The answer is emphatic that this can be done. There are several methods of preserving corn stalks and of using them, already in practice to a greater or less extent, by which most of this waste is avoided, if not all of it. These can now be merely mentioned. Thorough curing and proper housing of the stalks for food will save a part of the loss occasioned by more careless methods. Cutting such good stalks into short pieces and feeding dry, will save one-half the usual loss, or more, and this saving will pay well for the labor of cutting. Crushing and shredding the stalks instead of cutting them, or cutting fine and crushing, and then allowing the mass to lie in a pile and soften by slight fermentation, will save two-thirds of the usual loss. The same course with the addition of warm water to thoroughly soften or steam the whole mass, will prevent at least three-fourths of the ordinary waste. The adoption of the silo system for storing, preserving and feeding the corn crop, so highly approved on the score of economy in other respects, will save seven-eighths or nine-tenths of the usual loss, and in many cases practically the whole of it.

The food material is in the stalks and is digestible. It is too great in quantity and too valuable to be lost. It is only a matter of changing the mechanical condition so as to render the stalks edible and palatable. This can be easily and economically done, in different ways, so that from one-half to the whole of the usual loss can be prevented.

Here is a lesson in corn stalk and farm economy which deserves to be studied and put in practice.

HENRY E. ALVORD.

Question—Is there any more nutrition in sweet corn than in other kinds?

Maj. Alvord—Less nutrition but more sugar. There is usually less food value in a ton of sweet corn fodder than in the fodder of other corn.

Question—You don't think there is as much butter?

Maj. Alvord—It depends upon conditions. It is not as well balanced a food. But no corn fodder helps to make butter, except by its favorable effect on the general health of the cow.

Question—Can the feeding value of corn fodder be saved as well by putting whole into the silo as cut up.

Maj. Alvord—Feeding value, yes, but it is more work to get it out. There is no loss in putting in whole. It is simply a question of work. I have never seen any corn put into the silo with the ears on.

Mr. Spear—There is some difficulty in packing the silage into the silo whole, so that it will keep as well as when cut.

Mr. Vail—Can you tell us the relative loss in stacking the corn in the field or putting it into the silo?

Maj. Alvord—As near as the most reliable experiments come, there seems to be very little difference. It seems to be a little more advantageous here to put it into the silo. The difference between the field cured forage, where one acre has been so cured, and one put into the silo has been tested in Wisconsin, and an advantage found in favor of the silage, regarded as chiefly due to its being a succulent form of food.

Question—If you took dry stalks and cut them a half foot long and poured on hot water would they be as good?

Maj. Alvord—Yes, as good and some better than if fed dry. I have taken corn from the stooks in the field, where it cured, cut it into two inch lengths and packed it into boxes and let it stand for two weeks. It then became quite soft. It will ferment and be warmed clear through. About twenty years ago I made silage by cutting up some corn fodder and packing it in a hogshead.

Question—Did it mould?

Maj. Alvord—Yes, a little, but that was not objectionable.

Question—A great many here, when they put their silage in, complain of its moulding. Does that hurt the fodder?

Maj. Alvord—Some of those growths are not injurious and some are. It is like the mushroom growth—some are good and some are bad.

Mr. Riddel—Will a cow eat anything that is not good for her?

Maj. Alvord—I don't think she will, if well and under good treatment.

Question—Can common seed corn be raised at a profit?

Maj. Alvord—That is a question that I have no positive opinion on. The farther North you go the better the seed corn is.

Mr. Mead—If it is a good thing to let corn fodder stand until it is ripe, why not hay?

Maj. Alvord—That direct question I can't answer, but it was shown at Chicago. In that part of the Experiment Stations exhibit devoted to feed products, the comparative value was shown of early and late cut hay, which was strongly in favor of early cut hay. Right opposite this was an exhibit by the Pennsylvania Station of the value of the mature corn and the advantage seems in favor of late cut corn. It was as striking in the late and early cut hay as the early and late cut corn, and I think all who saw it will stand by early cut hay and late cut corn.

Remark—People used to say that silage ought to be cut when it began to glaze, but now they cut later.

Remark—I have made silage for thirteen years and every year I have put it in later. The lighter the per cent. of water the better the silage will be, provided there is water enough to start fermentation.

Mr. Vail—Where the whole corn is put in, the fodder and the ears, say of the Flint corn, is there not a good deal of waste by imperfect digestion.

Maj. Alvord—The question of its mechanical condition, whether the animal will digest or assimilate it—is about the same as in dry corn—and I don't think there is much more waste.

Mr. Vail—I have noticed at the time of putting it into the silo that there used to be some kernels of corn in the gutter; that was when we cut it up after it was beyond the milk state, and I have been in doubt whether it was best to let it get so ripe or whether to cut it a little earlier.

Maj. Alvord—It seems to me that you go upon the principle that the corn is the greater part of the plant, but I have tried to show you to-day what is in the plant and if you could have examined the component parts of the plant in the exhibit to which I referred you would have observed a remarkable change in the corn plant itself. The contents of the jars containing the fiber decreased and

that of the jars containing the starch and protein increased. This increase of food value on an acre of corn, by reason of allowing it to mature, is so great that one can afford to lose a considerable part of the corn kernels undigested, and yet make a decided net gain.

Question—Why do you want silage fermented ?

Maj. Alvord—For the same reason that when we put up peaches we scald them. The process of fermentation is a preservative and is accomplished by heating. It is a question of ferments. It is a fact that heat checks and destroys ferments. The silo generates heat enough to act as a preservative of its contents.

Question—Do you press silage ?

Maj. Alvord—I practice pressing silage but only when I can find material to put on the top cheaper than the silage itself. If I put nothing on, a foot or two will be spoiled, and this silage well weighted down, shuts out the air from all below.

Question—Are you feeding from this all the time ?

Maj. Alvord—I don't begin to feed the day it is put in the silo. I usually allow eight or ten weeks to pass between the time I close the silo and the time I open it; and it must be weighted for this time.

Mr. Gabrilson—Is it not a fact that people here in Vermont begin to feed the silage as soon as put up ?

Maj. Alvord—In that case there is no need of weighting it. I have never had experience of that sort.

Question—In your practice did you pick the corn before you put it in the silo?

Maj. Alvord—I pick the corn off, or at least the good ears. I have use for corn and I save it for use on the farm.

Question—How do you feed your milch cows?

Maj. Alvord—Silage once a day—corn stalks, cut short, once a day, no grain with either of them, and also rye straw once a day but it is not all eaten. For grain I feed bran, gluten meal, rye meal and cob meal, if I have nothing else. This year I have been feeding rye meal because I had it.

Question—Do you feed cotton-seed meal?

Maj. Alvord—Just at this time I have a good deal of gluten meal and I am feeding that, and no cotton-seed meal.

Question—How do you regard cotton-seed meal as compared with gluten meal ?

Maj. Alvord—I consider cotton-seed the cheaper feed.

Question—Speaking about the St. Albans shredder—has it any advantage over the cutter?

Maj. Alvoid—An immense advantage. It crushes the joints and you can't do that with the cutter. Don't you like it better ?

Remark—I don't think there is much difference.

Question—I would like to inquire what effect a hard frost will have on the corn fodder.

Maj. Alvord—In my practice I have found very little injury by frost. In the Connecticut report you will find a per cent. between frosted material and the other. I have not found any difference except in mechanical condition.

Question—Does it lose value if put up in stooks ?

Maj. Alvord—Frosts destroy the mechanical structure. If the stalks should be really frozen, the little cells in the plant filled with water would be ruptured and there would be more liability to decay.

Question—I would like to ask if this acid we get out of silage has any effect on the land.

Mr. Vail—Well, I can answer that very quickly. I don't know. There is just this about that acid ; it represents just so much waste of feeding material. The sugar, or starch, changes to vinegar. It is in small quantities and has the same effect on the stomach as the small quantities of vinegar would have to us, and the small quantity we get in the silage has no effect on the land so far as I know.

Question—Does it not have some chemical effect ?

Mr. Vail—I don't know, it may have.

Question—In what way ?

Mr. Vail—It may have a chemical effect on the potash.

Question—Do you cut the corn or put it whole into the silo?

Mr. Vail—I use cut corn, for I never want to work hard enough to feed it out if whole.

Remark—I find in taking silage from my silo (it was shredded) that the corners had decayed, and I have heard others complain of this same thing. Can you explain the cause ?

Mr. Vail—Undoubtedly air got into the corners. I have heard that the modern silos have a triangular stick of timber put in the corners to fill them out. I think the atmosphere decays it.

Question—Can't it be packed into the corners so that it won't spoil? I don't think mine spoils in the corners.

Mr. Vail—I think so. There is a good deal not understood about this silo business. Some silage will get a little more acid or it will hurt a little more. I keep one of my silos open and feed from it continually. This year it commenced heating so much that I thought it would spoil and had to pack it down and wait a week or so before I could feed any more.

Question—What variety of corn did you plant?

Mr. Vail—I have used the Sanford and Longfellow corn—both have about the same growth of corn.

Question—Which would you call the better?

Mr. Vail—I hardly know which is the better. I can get the seed of the Sanford a little easier than I can the Longfellow. These two varieties are the only ones which I have found will ripen in a season.

Question—Do you raise your own seed, and do you have any trouble with its ripening?

Mr. Vail—I have had some trouble. I don't raise the seed. I never fail to get corn early and have it tested.

Mr. Fowler—Can you give addresses where to get certain growing Sanford corn?

Mr. Vail—I don't know of any.

Mr. Riddel—Do you put your corn in, corn and all into the silo, or only the stalks?

Mr. Vail—I put it all in because it is the cheapest way for me to do, as I have trouble in getting help.

Mr. Riddel—A good many people say they won't build a silo because it costs so much. In feeding out the silage, corn and all, do you feed other grain?

Mr. Vail—I feed other grain, cotton-seed and gluten.

Mr. Riddel—How does the cotton-seed compare with the gluten?

Mr. Vail—The cotton-seed by analysis is about the same as cream gluten but its mechanical value is greater.

Question—Is there much more value in the oil meal than in corn?

Mr. Vail –That is a question I have thought of for a long time, and have found that to make butter we must feed for milk. It is supposed that the animal manipulates the protein.

Question—Can you increase the butter fat by feeding.

Mr. Vail—I have seen the scientific men get into so much trouble over that question that I don't like to give my opinion. I have thought the scientific men and farmers should deviate on that question—both are right and wrong. The scientific men put a cow on a complete ration and then say they could change it through their feeds—for you don't make a radical change and keep up the milk, but if they change as farmers do, and there is waste, (sometimes they get more milk than at other days) it might be there and the farmers not get it.

Remark—Two or three years ago I fed cotton-seed meal, and I stopped because my wife said it didn't pay. I stopped and we didn't get so much cream, and she wanted to know at once what was the matter. The consequence is I am feeding it again with good results.

Question—Why is it that cotton-seed meal is injurious to cows beyond a certain limit?

Mr. Vail—I don't think it is, except as there is a limit to all those concentrated foods. One must feed very carefully.

Question—How high do you ever feed a cow on cotton-seed meal?

Mr. Vail—I find farmers feeding at the rate of about two quarts a day, and I have had some knowledge of the feeding value. I never feed more than two quarts and consider that too high. I have known cows to be injured by feeding two quarts. Limit depends on the cow. Some cows will take almost anything and digest it.

Question—Do you think two quarts of cotton-seed meal too much for a cow?

Mr. Vail—It is rather dangerous to feed so much. You will notice it by the cow's becoming feverish and it will exhibit itself in various diseases, as garget, etc. I would not advise feeding so much.

Question—If you had a dairy of cows capable of making 250 lbs. of butter a year and you had silage and good hay, what would be the ration of the above feeds so that they could produce 250 lbs. a year?

Mr. Vail—The proper way to balance hay and silage is to use bran, gluten, or cotton-seed meal.

Question—How much per day of the different materials?

Mr. Vail—Maj. Alvord advises feeding from eight to ten pounds of the mixture per day. I should advise about five per day. My hay is mostly clover. There is a great difference between early and late cut hay.

Mr. Spear—You would have to use a different grain ration for every day?

Mr. Vail—Yes.

Question—Should not Vermont farmers raise more corn? Is it not fed less than other feeds?

Mr. Vail—I think farmers cannot raise too much corn.

Question—With two quarts of bran, and two quarts of corn meal, how much cotton-seed meal would you add?

Mr. Vail—I would try an experiment of that kind. I can't answer the question. Some cows might have a capacity for giving more milk, and some could endure treatment that others could not.

Remark—I have tried it, and they don't give much more milk but more butter.

Mr. Vail—In that case was your corn picked off from your silage?

Remark—It was. My silage was made of fall corn which was pretty ripe before the corn was picked.

Mr. Spear—A year ago I made the mistake after cutting the corn of letting it lie on the ground for some days before putting into the silo, the result of which was that the frost injured it and it became so dry that much of it spoiled. I think it keeps better to cut when green, or at least only wilted.

Remark—I have had a silo for four years. My practice is to husk the best of the corn and cut the rest into about four-inch pieces for the silo. I grind the corn and feed the meal to cows and other stock. I question its paying me to buy cotton-seed meal and other concentrated cattle food. I believe farmers can raise their own grain.

Mr. Vail—Do you buy phosphates?

Remark—Yes.

Mr. Vail—Whether he can buy these meals to feed his cattle I don't know. It is a fact that I can make it pay, and it is a fact that many close dairymen do also. It is a fact that in buying this cotton-seed meal you get its value nearly in fertilizing value. I never tried picking the corn off, but I have figured up and found out how much it costs to husk, and how much the toll will be, and then there is the waste and the time and labor of growing and carrying it to mill, and I find I have spent a little more money than it would take to buy it. I have to feed corn to the hens, and I have a kettle for that purpose, but I put most of it into the silo. Many of my friends have tried this way, but now they put in the corn whole as I do.

BRAINTREE INSTITUTE.

Mr. Gabrilson—Many of you know that I am from the West and more of you know that I am a guest of the State at present—that I am here to study your methods. I might say something of the methods of the West. We have been sending our products to the East to enrich your lands which you have been over-cropping. The time will come when we in turn must do this and we must restore the fertility of the farms that we have been working. The state of Iowa has been a state for fifty years and is much like Vermont in its methods, government and politics. We have been driven into dairying very largely because of the failure of our wheat crops—the state was once a large wheat field—and now the work of dairying is carried on in creameries much as it is here. I have been interested to watch your methods here in Vermont, and one thing has surprised me. I don't think you are as careful of your waste products as you should be. We have been accused of wasting the fertility of our lands. You spend much for commercial fertilizers and you buy western products to enrich your lands and let much of your own go to waste. It is well known that the value of the food as fed to animals is composed of many elements, some of which help to maintain the growth of the animal, and some of which are returned to the land. Corn is the most expensive food that you can buy, of that which is grown in the West. Our bran is one of the

richest foods, in a plant food, that one can buy. You can grow all the corn that is needed on your farm. You can grow grass, clover will grow, and I think you can become independent of the West, except as you want to buy for enriching your farm. The question of private dairying has interested me. I have been surprised to see how many make up their own butter in the East. You have an advantage over us for you are so near the markets of the East, while our butter must be a week or ten days on the road. You have this advantage over us, and we have the advantage of cheaper food. Our facilities for making butter should give us an advantage. We have in the West no large cities, nor so many small cities as you have in the East. We must send to the Eastern markets. Chicago has from Iowa thirty-four millions worth of butter per year. With your advantages here you can produce a butter that should sell for over five cents a pound more than usual price, which you should get for your share of the working. Private dairy men can have the advantage of the creamers, for it is possible to do the work on the farm which is now done in the creamery, and the expenses of working up the product might be kept on the farm, if those who had the farm were able to do it. With our methods, what it costs to make butter in our creameries, I don't know. In the West the cream is raised on the farm. We have the co-operative system, and there is a difference of as much as seven cents a pound in the selling price of the butter. Two or three cents of this goes for transportation and the rest to the creamery. This item alone in Iowa would amount to $400 a year with a man who has a large dairy. I think the best way to do the work is to do it away from the house, so that the woman has nothing to do except to take care of the milk vessels. We use a separator and I believe it will take the place of the deep setting of milk. Advantages are in favor of it as I have proved in my own experience. Of course the expense is great for buying the separator, but with a herd of twenty-five cows I know by actual fact that we have saved the price of that outlay in one year. The question of milk hauling seems against nature. It seems wrong that the milk should be taken from the farm to be skimmed. The saving by the Cooley system is about equal to the creamery system. We find there is

always a market in the West for one who is willing to do private dairying. There is no danger that his part of the work will be overdone, for there is only a small per cent. that are willing to take the pains to make a butter that is above the creamery butter. The making of butter is a fine art, and those who will take the pains are almost sure to be rewarded for their work. As I said, I was surprised to find how many in this state are doing the work at their farms. I believe that this system will grow and that the work will be separated into one great monopoly as Mr. Sanford suggests. I have been very much pleased with my visit East and among your people. The World's Fair has tended to bring the people of the states nearer together.

Mr. Manchester—I would like to ask the gentleman what is the average feed in the West?

Mr. Gabrilson—Hay is our principal feed ; corn and oats are used. There is but little use made of the feeds which you use here, and the study of them has been a surprise to me, for we don't have them. I had never seen gluten feed or cotton-seed meal until I came here. We did use some oil meal, but very little indeed. That is why, I think that we can produce a butter so much cheaper than you do, but you have the advantage in being nearer markets.

Mr. Manchester—We pay out here a thousand dollars a year for bran. Do you use it much ?

Mr. Gabrilson—We are beginning to use bran in a moderate way, but very little of it. In Iowa very little is produced. We don't pretend to raise our bread there. Corn is our chief crop. We get our bran from Minnesota, but here, as I tried to show you, you buy your bran and Western feeds and consider their value as a fertilizer. I think it is a mistake for you to buy any commercial fertilizers. I think in the feeds you buy are the elements of a fertilizer which you can get much cheaper than the commercial fertilizer which you buy.

Maj. Alvord—I agree with Mr. Gabrilson very fully, and for years have practiced purchasing feed instead of fertilizers where something had to be done, and believe that this should be the first consideration —the fertilizing value. The cheapest commercial fertilizer that can be bought for the land is cotton-seed meal. Put it right on the land,

without regard to its use as a feed. There is much plant food in it, and for the last six years I have made it a rule to buy a carload of cotton-seed meal and feed as much as I dared to, putting the rest on the land.

Mr. Sanford—Isn't its fertilizing value nearly all in the nitrogen?

Maj. Alvord—No, it is largely nitrogen and phosphoric acid, and it is low in potash—it must have potash added to make it a perfect manure.

Mr. Vail—Do you buy cotton-seed meal to feed it to your stock or as a fertilizer?

Maj. Alvord—We buy the bulk of cotton-seed meal as a fertilizer for it is worth what you pay for it. I say that money is saved by putting it into cotton-seed meal, I don't say it is best to put it on the land if you can feed it. Because for the purchase of a ton of cotton-seed meal, if the manure be taken care of which results from the feeding, the meal is worth from four-fifths to seven-eighths of the original cost of the cotton-seed meal. It depends upon the care of the stock and whether all the milk is used on the farm. I believe that the milk should not go away from the farm, and that it is not good farm economy to carry the milk away and carry it back again. I believe the cream gathering system is the ideal, that is, the co-operative system. It saves transportation of the milk. In 1876, at the time of the Centennial, Eastern dairymen first had their eyes opened to what was being done in the West. At Philadelphia the Iowa butter came to the front, until, at the end of the exhibition two-thirds of the butter premiums went West and Vermont got one. That started men to thinking. Not only was the quality good but the quantity was prodigious, and Boston markets preferred Iowa butter, paying more for it than Vermont butter as a general thing. It was then also found that a car load of meat traveled through this state to Boston in a refrigerator car and the whole for less than it cost a Vermonter to get his butter there. It was about this time that the record was put on, four years from the first record made. Then came the question, why should we not have some advantage, and do as well as the West, and so the creamery was agitated. Iowa sent good butter, better butter than the Eastern butter which was

going to market in small packages. A merchant could go to the car and take a sample of the butter from Iowa and have an average of the whole. The fewer the churns the more uniform the butter, and it was in this way that the large quantity of butter produced in New England was brought up to that of Iowa, and now the Eastern creamery butter sells in the markets at about the same price as Western butter. The creamery system is of the most benefit to those who are not practical farmers. I have never believed in urging the very best butter makers to go into the Dairy system. Those who are noted for a fine quality of butter and also for having a good market for it, are not the men the creameries are made for. I don't believe they are going to increase now as to the cost. Eight years ago we started co-operative creameries in several states, with the cream gathering system, where the total cost of taking the cream from the farm and marketing the butter is between three and three and a half cents a pound. It must be kept under four cents to succeed, and where it can be kept under four cents the farmers with ten cows get enough more butter of a better quality, to bring just as much money as they got when they made the butter at home. If it costs more than four cents a pound then they don't get as much as when made at home. I believe that it costs a great deal more than three or four cents in all where the milk is hauled away from the farm and back again; not to speak of the wear and tear on team and men. I don't believe it is true economy, and a New England farmer will see that it is not good policy to draw his milk away and back again.

Mr. Manchester.—I want to ask Prof. Alvord in regard to cotton-seed meal. Many people think that it is injurious to a cow to be fed on cotton-seed meal when she is young.

Maj. Alvord.—I have given a great deal of study to cotton-seed meal. As I said, I feed as much as I dare to, and believe it should be fed with great care and judgment, and only where the owner sees the feeding done himself. Animals don't vary much as to their capacity to assimilate and make good use of it without injury. Over feeding or wrong feeding is injurious, for this is a very rich feed. It is too nitrogenous, having too much of the bone and muscle forming element and too little of the heat producing element, and if the

man who has been feeding a rather low grade of hay and five pounds of cotton-seed to his cattle, should change to a clover hay and not change the same amount of cottou-seed, he is in danger of injuring his cattle. When he changes to clover he should reduce the cotton-seed. Not only is it injurious, but it is expensive and we cannot afford waste. Any of the nitrogenous foods in that line should be used with a great deal of discretion, no more than an animal will assimilate. Keep the manure question in sight all the time.

Mr. Flagg—What kind of cow does the Board consider the best for general purposes ?

Mr. Vail—The very best breed of dairy cows Mr. Winslow has obtained for this purpose, as he may tell you, is the Ayrshires which he is breeding ; I am breeding Jerseys. About this hospital matter—I have never had one but it is a good thing on any farm to have a place where sick animals can be taken good care of. It is seldom that a man having a lot of animals has not some sick ones. I believe the Jerseys are healthy and vigorous, will consume less food and make more return for it than any cow, unless it be the Ayrshire.

Mr. Flagg—It depends a good deal on what you want of a cow. If you want to produce beef, as Mr. Vail said this morning, you don't want to get a dairy cow. Dairy cows have their special use. There are some breeds more profitable for other things. The dairy cows at this time are the Jerseys and Guernseys. The Jersey proved herself at Chicago the best butter cow. The best cow for milk is the Ayrshire. The Brown Swiss is the best for the general purpose cow in my opinion.

Maj. Alvord—When you come to fight the battle of the breeds, I rise to say that the very best cow is a cross between the Jerseys and Ayrshires, and the very best cow I ever had was one of this kind for general farm and dairy purposes, but of course in this place or in other communities where the milk is going to the creamery, I believe the Jersey blood should be on top for butter making. With the grade Jerseys use always a pure blood sire, rather a pure bred sire of a breed you don't prefer than a grade bull. This is the kind I believe in for a profitable dairy and I don't think there is any danger from lack of constitution, espec-

ially among the Ayrshires and Jerseys. It has been my fortune to handle a herd of pure blood Jerseys, and although I did not have a hospital, if you please to call it so, I had a place where every animal was kept for a week, or died off, and for five years I had no sickness except three cows with milk fever. This was all there were except a few cases where calves died from inherited bowel trouble, and one cow that I am satisfied died of tuberculosis. I have handled from twenty-five to thirty Jerseys annually for years, and have had no cases of sickness, and have lost no animals from milk fever, but have lost some by tuberculosis. Other cattle are infected by being kept in a barn in which it has been. I do believe that animals of pure blood crossed upon animals of coarser blood will give the strongest and most vigorous animals.

Mr. Vail—Our friend, Maj. Alvord, seems greatly in favor of harmony, but I don't think he could cross us any more than by this cross breeding. I am of the belief that the full blood Jersey is the cow for the dairy and the ordinary cow for the country. There is nothing that has made such progress over the country as this grade Jersey, and when a man makes three hundred pounds of butter annually we find that he has the Jersey blood graded into his stock. Milk fever is the bane of dairymen. Now and then everywhere cows are struck off by this disease. Maj. Alvord speaks of the calf difficulty. Luke Fisher of Cabot, the man who has made four hundred pounds from his herd of twenty cows, offered a hundred dollars if any man would give him a receipt to cure the white scours. His calves are dying off and I have heard within a week of several other herds in different localities where it seems to go like a blight. I don't understand it. I don't know as Veterinarians do. I had trouble for a year or so with it, but since that time I have had no trouble.

Mr. Manchester—"Variety is the spice of life." We have taken a different departure from most of you in breeding cows. I had the Holstein fever a few years ago, and procured a couple of imported cows, bred them somewhat, and within the time have raised several cows, sired by full blood Holsteins and from full blood Jerseys. Talking about crossing, the Holstein cow is discarded by all of you as a general purpose cow for dairy purposes; but for giving milk

the Holstein can't be beaten. The science of crossing Holsteins with Jerseys is what I want to speak of. I believe the dam is as fully responsible for the grade cow as the sire. I tested three cows yesterday morning, and they were sired by full blood Holstein bulls. One tested 6.02 points. Now if I had six grade cows, sired by Holsteins and of Jersey dams, I should be satisfied.

Question—How much milk do you get from a cow?

Mr. Manchester—I think about eight quarts—an eight quart pail almost full.

Mr. Sanford—The next question most important for every dairyman, is that proposed by Mr. Spear—the feeding of stock with the idea of obtaining production, to keep in mind the welfare of the herd and maintaining the fertility of the farm. I would like to hear from the men here on that subject. We have been considering cotton-seed meal and these concentrated feeds, and how few there are who understand these feeds and their fertility. Our farms need the fertility. Do we raise enough clover, which is about the only crop we can raise on the farm for a well balanced ration? We are making mistakes all along the line. I asked a gentleman, in that business, about how much he sold, or rather what he sold most, and he said corn and oats. Can you afford to buy corn when you can raise it for twenty-five cents a bushel? Can you afford to buy oats and feed for the prices you get at your creamery? Many of you have heard our friend from Washington discussing cotton-seed meal and feed that you buy here at $26.00 a ton, being worth $20.00 for fertilizer—and yet you buy corn and oats, when cotton-seed meal gives us a fertilizer we need. Can I, as a practical dairyman, feed my cows a perfect ration, which we can raise at home? We can gather this protein from the farm by raising peas, by raising clover. These are questions for us all. I don't feel like advising. It depends upon a man's condition. The cheapest food for a cow is clover.

Mr. Howard—Would you depend entirely on clover or would you feed meal?

Mr. Sanford—Yes, we feed corn. We need more corn, but I would not send away for it when we can raise it so cheap, and when statistics show that we can raise more corn to the acre than any other

State. The silo helps us here. When you see a man raising corn by the old methods, he grows less and less year by year; while the men who are using the silo grow more and more every year.

Question—Shall we feed clover all the time?

Mr. Sanford—The cow needs change as much as men. I would feed straw every day, rowen every day, hay every day and grain every day. They want a variety.

W. S. Abotts—It occurs to me that a man who feeds straw and rowen every day would have no need for hay. It has been my experience that a cow would eat only good food, as hay, and leave the straw. I have other uses for straw. I feed cotton-seed meal, corn meal, rowen and hay. I can raise corn for twenty-five cents a bushel. I have had some experience in dairying on a small scale, and find that by careful breeding and careful tending to the stock we can get pretty good returns from a dairy, and that the prices we get from the dairy and the use of the skim-milk for feeding calves should more than pay us. I have only a few cows, and have taken pains to breed for the best results I could get for the dairy, so that for the last few years I have been able to get 300 pounds from a cow, and have a most promising herd of cows, a strong cross of Jerseys. I met Mr. Bennett when he was importing cattle, a few years ago, and he said that for the average farmer the cross was better than the full blood Jerseys which he was importing, and so I have used one of his animals upon my herd. Since then I cannot remember that there has been one considered poor by the purchasers, for they gave universal satisfaction. I am glad it is possible to increase the product of the cow by careful tending and breeding.

Remark—Maj. Alvord says he would like to hear something about the dehorning of cattle. The calves of dehorned cattle must all be dehorned. It seems to me to be a cruel and unnecessary practice, and I have been breeding to get rid of the horns. I have had very good success in using a sire that had no horns. He is the most perfect animal in shape and form that I ever saw, even in the form of the head. Many of the cattle that have no horns have a protuberance that is very unsightly, but his head is smooth. I sold some of these cattle recently, and the purchaser said they

looked very hardy. I have fed that animal nothing but meadow hay, and he is a perfect specimen of a well kept animal. It seems to me better to get rid of the horns in this way.

Mr. Sanford—What breed is your animal ?

Remark—His father and mother were both sired by a full blood animal of a Jersey herd. They got the horns bred off from a cow further back.

Mr. Gabrilson—The question of dehorning is one that seems to be interesting to everyone in the meeting, because of the pain of getting them off. Our friend has told us of a phenomenal case, giving him an advantage over us. The only breed that we have, without horns, is the Red Pole.

In regard to taking off the horns: It is as common in the West as raising cattle, and now it is impossible to find a herd of cattle with horns. We apply a caustic pencil when the calf is a few days or hours old. The question of taking off the horns is a matter of necessity. The pain we inflict by the operation is slight in comparison with that which a cow inflicts upon her fellow by a gash from the horns.

Remark—In regard to horses. Does it pay to raise them ? You can't get more than twenty-five dollars for a colt four years old.

Mr. Scott—I have been in the horse business for over fifty years and my idea is, if you have a trotter, not to say anything about it, but take it from place to place and skin them out, and if you get a good offer sell it; then raise another to take its place—and sell that.

Mr. Manchester—I was gratified while Mr. Winslow was speaking. I had occasion to break five colts this fall. My way is to put on a halter and keep well to the side of the colt. Don't look him in the face or he will stop. In a very few minutes you will find the colt very gentle, and in this way they can be broken easily.

Mr. Winslow—I was, the other day, in Col. Russell's stables near Boston, and I was particularly struck with one thing about the man. He had a herd of imported Jersey cows there, and as he showed us around, he took us to see his horses in the box stalls. He went around the horses, patting them, and one of them came up and nosed him around until he got her some oats. When he came

to the cows he said, "Here are my cows; you might like to look at them. I don't know but they will look as well lying down as standing up." It struck me he loved horses and liked Jersey cattle. It is the same way with lots of people.

Mr. Vail—I understand that Col. Russell is quite a noted breeder and has quite a number of registered Jerseys. He doesn't want to kick up his Jerseys; because he loves the cattle too much. I believe in breaking horses. One day at our place a little boy twelve or thirteen years old had an old mare that was afraid of fire-arms, but having seen circus pictures he wanted to get this old mare so she would perform. So he tied her to a post and set off a whole bunch of fire-crackers. When they went off, he said she broke her halter and started for the mountains. It was not known for a long time what made that horse afraid of fire-crackers.

# DAIRYING.

## GEORGIA INSTITUTE.

Mr. Winslow—Dairying at the present time seems to be the leading farm industry, and the one from which the farmer receives the most ready money. As the cow is the foundation of the dairy, and as profit or loss depends chiefly on her dairy quality, perhaps a few suggestions in regard to the selection of dairy cows may not be out of place.

The natural milking tendency of a cow is to give only enough to support her young until old enough to obtain its food by grazing, and the present excessive milking quality of our best dairy cows is an acquired habit, built up slowly by careful selection, judicious breeding, and good feed. Cows may be divided into two classes, beef cows and milk cows, and the profit of the dairyman is chiefly determined by the degree his cows are removed from the beef type.

The production of meat is more natural to cattle, and it is much easier to produce a high type of a beef cow than a milk cow.

Of course the pail and churn are the truest tests of the value of a cow for dairy purposes, but there are external indications that are used by experts, to determine, with a good degree of certainty, the value of a cow for either beef or dairy.

There are breed characteristics which reveal at a glance the family or type to which she belongs, but there are also milk and beef points that are common with all breeds in their distinct types, and there are also points that are alike common to both types. Large food capacity, strong digestive organs, good constitution, are essential points for profit, and are indicated by a large muzzle, large paunch, soft hair, mellow skin. The large mouth and muzzle are necessary, as indicating a good appetite and lack of daintiness in eating. A cow with a large muzzle and large mouth is not so liable to pick over her food to select the best, but is hearty and

takes it as it comes, which is an important point on a farm. We keep cows for the profit we hope to receive from them. The profit of the farm comes from the sale of what is produced on the farm, the hay, straw, stover, silage, etc. If we can sell it to the cows, at a fair price, we are doing profitable farming, but if we have cows that are so dainty that they waste as much as they eat, and oblige us to supply them with expensive, purchased food, it consumes the income of the farm, and we make no profit.

Poor constitution, delicacy and daintiness in cows should be carefully guarded against.

Coarseness, being the other extreme, should also be avoided, as indicating a lack of ability to make the best use of food eaten. From the muzzle to the eyes, the cow should be fine, eyes large and mild, indicating an intelligent animal of good disposition.

Some prefer a long, narrow head, and others a short, broad one. For myself, I prefer a short, broad head, believing it indicates a quieter disposition. The foregoing are about all the points in common between a beef and dairy cow. The remaining points are exactly opposite, between a beef and dairy cow, and the extremes in opposition are as a rule types of excellence.

The neck should be strong at base of brain, its junction with the head, thin to shoulders with scarcely any dew-lap or brisket, fore-quarters light, but heavy hind-quarters, shoulders thin, with the back bone rising slightly above the shoulder blades, the joints of the back bone loosely joined so as to present a marked indentation as the hand is moved along the spine, wide pelvic bones, thin flanks. The opposite of these are found in a cow of beef tendency, heavy dew-lap and brisket, considerable width on top of shoulders, and sunken spine, the joints of the back bone tightly placed together and presenting a smooth feeling to the touch as the hand is moved along the back, heavy flanks and hams, the place for the udder being filled with meat. The udder in a dairy cow is usually capacious; but cows give good milk or large quantity from all sorts of udders; still the veins that supply the udder are guides. In the dairy cow they should start from the front of the udder on either side running toward the fore legs. They should be large and winding like a brook running through a meadow, and enter the belly

through a large hole. The larger and crookeder the veins, and the larger the hole, other things being equal, the larger milker is the cow liable to prove. The perpendicular cords on either flank and between the thighs extending to the sides and rear of the udder, are also indications of the milking quality of a cow. The comparative size of the hole at point of shoulders is also another indication. The larger, more even the development of these points, the further is the cow removed from a beef tendency. The general appearance of a good cow is feminine.

The real test of a cow is, of course, the pail, and actual production, but a good dairy cow is not found without some of or all these outward indications. I know of no reliable outward indication of the quality of the milk; that must be determined by actual test, for which modern invention has given the Babcock tester to the dairyman, an inexpensive machine, simple in construction, easily managed and reliable.

With an understanding of the dairy type, the Babcock tester, and a scale to weigh the milk, there is no reason why the dairyman of to-day may not know his herd individually, and be able to keep only cows that pay a profit. Until recently the dairyman has labored in the dark, and has kept good and poor cows, those that paid a profit and those that were an actual expense, but there is no excuse for this now. A complete outfit for testing can be bought for some ten or twelve dollars; tester, scale and chemicals. Neighbors could unite in owning them as it is not necessary to test or weigh very often.

A composite test of four consecutive milkings, about six weeks after calving, and again in six months, will give a substantially correct idea of a cow. It is as necessary to weigh the milk as to test it, because one cow may give milk of very rich quality, but in such small quantity as to make her not as profitable as another which gives a larger quantity of poorer quality. The only way to know exactly is to weigh the milk, take a sample, and multiply the quantity of milk by the percentage of butter fat and add one-fifth to the result, which will give the amount of butter the cow would give in that time. Suppose one cow gave 20 pounds of milk in one day which tested 5 per cent. butter fat, and another gave

25 pounds of milk which tested 4 per cent. butter fat, there would be no difference in the amount of butter they would make. For this reason it is not safe to condemn a cow because her milk is not of as high percentage as another, until you know the quantity of milk she gives, and figure it out.

Mr. F. S. Bliss—In raising calves for the dairy I use linseed meal and skim-milk. What do you think of its use?

Ans.—I have never tried it. I use skim-milk and dry bran.

## JOHNSON INSTITUTE.

Mr. L. C. Fisher—Some years ago I began dairying by trying to make butter from a few common cows that yielded about one hundred pounds per cow. Not being satisfied with this yield, I purchased a few Short Horns which helped the yield a little, but were not satisfactory. I admired their size and quiet disposition, but what I was after was butter, and after looking around I determined to try the little Jersey, and have grown more and more satisfied with her as the ideal butter cow. Now I make over four hundred pounds per cow.

The requisites for successful dairying are good cows, of good breed on both sides, good feed and good care.

# THE DAIRY COW.

## MARSHFIELD INSTITUTE.

Mr. Vail—I am very glad to meet the people of Marshfield and discuss the matter of dairying. In riding through the different parts of your town I can see that you are a progressive people, with land well adapted to dairying. I hope it will be still more so. In the late changes that have taken place along the line of our agricultural products, it would seem to indicate that the dairy is to be the principal product of the farms. We do not know what changes may take place along this line, beneficial to the farmer. I would not advocate getting rid of any stock. It is not well to sell off your stock when it is low. But many of us are already dairying, and we want to do it well. This question has long been discussed. We have had factories established and put into the hands of dairymen who have all the qualities of good dairymen. There is always something to learn in this industry. I was a little surprised, in the lecture on the Experiment Station, to find what they had done for dairying in this State. It is a work of which we have reason to be proud. We find that the average dairyman of our State is an intelligent man, a progressive man, who is trying to get at the head. Right here is where the profit comes in, in getting the most from an acre, in getting the most from a cow, in getting the most from the feed, in getting the most from the waste of the dairy; that is the only way in which we can make anything from a dairy. There has been a time when even the butter dairyman and the farmer could make a profit, when the competition was not so great, before the West and creameries came in. When our pastures were rich, at a time when we could turn our cattle into fields where they would get a living, then we could fill the pail, and get a liberal amount of butter. The character of most of our Vermont pastures

has depreciated, and the cow if she is to do her best must fall back upon the tender mercies and intelligence of her master. Now we have new questions to meet. The pastures seemed to stand a few years ago as a barrier against the progress of dairying, but there are men who are overcoming that by increasing the fertility of their land. We sometimes see the question of dairying divided into heads, and we shall divide it so to-day. Mr. Sanford will have one head. I have divided my topic into the cow, the food, and the care of dairy stock, and that does not comprise all the heads of the subject. There is the whole product, the handling, care, and marketing of it. Some of them we could discuss for half a day very profitably. In discussing this, it is like "The greatest of these is charity." I believe the greatest of these qualifications is the *man*. If we have a man who starts out in dairying with the determination to learn the subject in all its detail, with all his energy to carry out and fulfill all the conditions, there is nothing that can stand before him, if he will overcome all the obstacles, as a great many men in the State have done, and make a success of dairying. Now the question of the cow is an important one. I have seen it stated, within a week, in one of our leading dairy papers, that they did not regard the kind or breed of a cow as important. Give her good feed, and warmth, and success could be gained with any cow. Now that is yielding one-half the battle, for the man who starts in with a poor cow is handicapped; each cow has an individuality and to ignore this is to ignore all the established rules of breeding stock. The cows vary, even in a thoroughbred herd which I have been running for years, and the capacity of cows bred for butter, selected after we have taken great pains, will vary all the way from a profitable cow to an unprofitable one. Wherever you find a man who has made a success with his dairy, he has paid attention to the selection of cows that will take feed and turn it into product and into money.

Now we have said something sometimes about breeds, and they accuse me of advertising my own breed of cattle, but we think the time has gone when we can be accused of this—when we say

that the Jersey is a superior butter cow. The Guernsey is a cousin of the Jersey and is a close competitor. I am not speaking against the cows of other breeds. The Ayrshire makes most economical use of her food, but the Jersey cow stands at the head as the profitable butter cow of the country. If you should decide to get a Jersey cow, get the best you can; there are poor cows of all breeds. There is that little Babcock test which can be had very reasonably, and it is easy to make a combined test of two or three days' milk, in this way easily getting at the per cent. of butter in the milk of your cows. I find in selecting cows I cannot ignore that. In testing some cows, under the same conditions, we were surprised to find two heifers, two years old, one giving 34½ pounds of milk, and which gave by the test two pounds of butter a day. There was another heifer, giving only 18 pounds of milk, and her milk tested by the churn two pounds and two ounces. An ordinary dairyman would have held the one giving the most milk at the highest price; the cow that was giving the least he would have regarded as a rather unprofitable cow. Now let us look at the cause of producing the milk. The 34 pounds of milk is composed mostly of curd, which goes largely to waste, and when we consider these things, we can see that it costs more to keep the one that gave the most. That illustrates a point I was trying to make on the cow. There is another feature of the question here, a feature of the cow which has recently been discovered and which is not so generally known—that in making her milk she secretes a large amount of it during the process of milking. Cows have been butchered to find this out. When her udder is distended only about four quarts of milk can be obtained, and it has been shown that the cow actually secretes the milk during the process of milking. In what state this process is carried on I don't know. It is similar to the process of mastication. When we say that a cow holds up her milk, there is some disturbing element so that the glands cease to perform their work in a proper manner, and she merely does not secrete her milk. You know that if a cow comes down from the pastures running, or is chased by a dog, or if her calf is kept away from her, she is disturbed in that way. I have known heifers to be ruined in that way, by holding up their milk.

We often forget how little it takes to disturb her at the manger, how the holding back of the milk, or the non-action of the glands can be effected in this way. I have visited Mr. Skinner who was about the first man who had made 400 pounds from a cow. He was taking care of the cows, fed them himself, and could tell all about the disposition of each cow—why, he fairly loved those cows. He allowed no one to go into the barn when he was milking, as it seemed to disturb the cows, and he had discovered that they gave a little less milk when any one was there to disturb them. We have all of us discovered something in that line. When we are running a winter dairy, as I have been for some time, and want to get as much out of the dairy as we can, if we let a new milker go in, we don't get so much milk. Mr. Sanford, in speaking on this subject, has told of the way the maternal instinct influences these changes. He described the mental condition a cow should be in to do her best. He also described her with her calf; how she hid the calf in the bushes or tall grass, and fed until her udder was full, then looed for the calf to come and feed, and how the cow looked around and appeared delighted. Mr. Sanford says he has seen the cow fairly have on a broad grin. Maternal affection, which goes along with the milk, is there illustrated, and the more the better for the cow and for the man's pocket. I have been interested in watching my own dairy, for we have been looking up to see what we could do, and have made a very good yield. Sometimes it would drop off but we almost always found a cause. Once I found the man had changed the hay he was feeding. We had been feeding early cut grass and he had changed to later cut. The hay was all brought into the barn from the tenth of June to the first of July, and no one would think that that would make a change, but I went back to the other hay, and in a day or two they were back to their usual amount of milk. We were milking some heifers and it happened that we exchanged, he milking the heifers that I had been milking, and we found that we got more milk by milking our own. Now this young man is around those cattle and takes as much care of them as I, but they want the same person to milk them right along, to do their best. At another time there seemed to be a shrinkage, and it seemed to

be at one end of the stable. Now in milking one morning we discovered a little draft of air that came across the udders of the cows. We stopped the little crack up, and in a short time they were back again to their old yield. You need to watch your dairy very closely, for all these things belong to the best handling of dairy stock.

## FOOD FOR THE DAIRY COW.

Mr. Sanford—It occurs to me that there has been a great change in the dairy business, in this respect; that dairying has become a skilled business. This audience is composed largely of dairymen, and I know by your countenances that you are skilled men. Last week, having been gone from home three weeks among the farmers of Vermont holding these meetings, I was in a town in Massachusetts where the business was manufacturing. It was evening, and I saw a friend in a wholesale store where there was a group of men, merchants mostly. They inquired when I got home, and about the condition of things in Vermont. They were discussing the hard times, and trying to devise some means for relieving the poor in their city, and they asked, "What is the condition of things in Vermont; how are you affected by these hard times?" I had observed the condition of things in Vermont, and I told them I failed to see there any signs of hard times. The business is dairying up here; and the dairyman must be a skilled man. I am astonished at the number of creameries constantly being started in the State, and at the scarcity of help throughout the State. Now these merchants asked if they could send men up here. I told them if they did they would starve; we had no use for them. What we wanted was skilled labor on the farm. I thought of the difference between the laborer or worker in the factory, and those on the farm. Every New England city is taxed to its utmost. Not ten days ago one of the preachers of Boston made the declaration that the city should pay the fare of their poor into the country that they might find work. But they would be of no use to us; they might as well tie a stone around their necks and throw them into their harbor.

We discussed, this morning, the food for the dairy cow, which is a most important question for the farmer. Very much depends upon the food of the cow. For success it is necessary for the man

to know what the cow is; it is necessary to know the physiology and habits of a cow, and then one is better able to feed for health. Right here I will speak on the frequency of feeding. How many times a day would I find you feeding your cows if I should question you? Some would say they fed two or three times a day, some would say six; some of you are feeding three times and some four. I used to feed six or eight times, to keep the cow eating; and to get in all you can seems to be the idea some have of feeding cows. The cow is so constructed, and so disposed, that she goes out in search of food and gathers it into a large sac for storing it away. She does not eat it, but finding a retired, restful place she eats it there and seems to take much enjoyment. A cow should not be disturbed, especially when eating. We used to feed them a little the first thing in the morning, and then after breakfast feed them a little more, at noon feeding again, and again at night; then just as she was settled for the night rouse her up and give her some more. It is wrong; she must have time to eat her food, and in order to do the best she must be kept quiet and in a peaceful frame of mind. During the winter give her a good morning and evening meal and let her have the middle of the day for eating, and the night undisturbed. I might say more about the health of the cow. *Feed for health.* Watch your cows and feed for health. I emphasize it again, *feed for health,* for this is where we must use judgment. The scientist lays out a formula—he knows one thing, and the cow knows another. I don't believe I have two cows fed alike. Consider their age and condition, for these things must be managed with judgment. We want to make some money out of the dairy. It is our business. A man runs a farm for what he can get out of it, and where he used to send his money West to invest, now he is a business man. Whatever he raises now he raises for a purpose, whether pigs, cows or sheep. He used to feed the cows to keep them alive until spring. We kept them as cheap as we could—but dairying now is dairying the year around—before, a dairyman was one only in summer. Dairying is a business economy.

What is the cheapest food for a cow? I would say our corn crops, and we might say a word about producing. First is the hay, and here we might improve. We used to begin the first

Monday after the first of July to do our haying, but now, since we are making butter in the winter, and since we are feeding for profit, we want to cut our hay early—earlier than we now cut it. We cannot cut too early. I don't want to argue the matter, but it has been demonstrated over and over again that the early cut grass is the most nutritious and has more milk producing qualities. The Germans consider the early cut hay as 1.5, or about where we find the grass of June. Cut your hay early, and let this be impressed upon the minds of every one. We do not estimate the advantage of early over late cut hay. Why don't the cows eat the dead grass of August? Because it does not contain the elements of what they need—it has largely changed to starch in its composition. It should be cut early; don't let it get ripe. It doesn't stop its growing. When it gets up, cut again and even three times. I judge from my own experience that we get more hay by cutting three times a year. I doubt very much, however, whether it pays to cut twice. This is very important, and I do not think enough has been said on the subject. We have been dairying the year around and bought all varieties of hay, so that I know what I am talking about. The hay that grows on these meadows the last of July and August is no better than straw. In doing this you get a crop of rowen which makes the best of butter. You get the hay secured early and have it arranged in the barn so you can get it out at the same time, for it should be fed together. The hay and the rowen—what next? What I might find as being a good thing for me, might not be as good for you. I should think you foolish if you should adopt all my ways. I do not think it would be best for me to raise corn. I can make something in making butter. I keep thirty cows, and if I should find I could do something more than I am doing, I should put in another cow instead of doing something else. I put in hay and rowen and then I put in corn. The question is, how to get that land back to grass again after it has been in corn. We have been raising oats and peas and it makes an excellent dairy food. We get oats and Canada peas; get the ground in excellent condition and sow the peas putting them in with a wheel harrow. When these are thoroughly covered, sow the oats, and when covered sow clover and red top.

It makes an excellent crop. Cut it early, as soon as it heads out, harvest it quickly and carefully, and there is a good food for cows. There is a great deal of protein in it. In the fall you can cut over again and get a good crop of rowen. We are using no grain, but like this mixture as it is equal to hay. I am unsettled now whether to seed in the grain or seed in the grass. I know dairymen who are doing this and getting a splendid crop, and dispensing with much labor. I have done it very successfully. I believe it is a good plan to plant corn two years, because it works the land so well. I find grain needs well worked land and then you can sow the grass and get a fine crop. I never tried it but once and got a splendid crop then. Now we have the hay, and we have the oats and peas, and a newly seeded field; but we have not spoken of corn. As our dairyman is not engaged in raising corn for market he is raising it for the dairy. The hay is the foundation, the hay, rowen and oats and peas, and now the corn. Last year I figured out my ration to find out what it cost, and I found that corn was the cheapest grain I could feed my cows, and as I think it costs us too much to raise it here, I get mine from the West. I do not think we should raise it, for it takes a great amount of work, and it does not pay. Yet there is a gentleman who tells me that he can raise it for twenty-five cents a bushel, and in the old way too. It takes much labor, when we must get rid of the excessive labor. We must bring our business where it can be done with less labor. We get along without the use of the hand hoe by use of machinery. How shall we handle the corn? We have raised it and it is ready for the cow—how shall we handle it? How shall I do it next year? How did you do it this year? When ready to cut the corn the farmer gets all the men and cuts and stooks it. He leaves it for weeks standing there in the field—think of the storms, of the rain and snow which beat upon it, of the squirrels and mice that feed upon it. Finally it is hauled into the barn and husked mostly in the evenings, keeping the boys at work, away from town and many places where they would like to be. It is husked—the ears are thrown in one pile and the stalks into another. The ears are stored in the barn, and the stalks—what of them? They are in the way—get them up in the barn and store them away, then we will

crowd the mangers, and the cattle will nose them over and eat some. Once a week we will clean out the mangers. All this means work. The corn gets dry, and we take it to the mill, pay the miller six per cent. for his work. Have we improved the quality of the corn plant? It has been a continual waste from the time it was cut. Does the farmer plant any more? No. He says, "We had five acres, let us cut it down to four, cultivate it and see if we can't get more."

The other method is the silo. Two men go along cutting and laying in piles and it is carried into the barn and put into the silo. Now as the result of this you find every man, who has a silo, has increased his acreage of corn. We find that this is a cheap dairy food and taken with the hay, rowen, oats and peas makes a grand addition. Now if we were not making butter or cheese, if we were not feeding for profit, if we were simply keeping cows through the winter just to keep them alive until we could turn them out in the spring, they must be taken care of, for we keep cows for profit—what we can get out of them. The Experiment Stations have been a great help to us. By experiments that have been made in Germany we can determine the disposition of the food in the animal's stomach. It is wonderful. They demonstrate what food has protein and carbo-hydrates, and that certain portions of food tend to build up the muscles and certain portions to produce heat. There is a combination of what is essential in the line of carbonaceous foods to keep the system in proper working order. It has been proved that the corn foods produce heat, and the question now is, where shall we get the protein and the nitrogen to build up the muscles, that is, in what food shall we find them in the most available form. Right here Mr. Vail has spoken of the milking functions of the cow. I want to give my idea—it helps in the feeding matter. We used to try feeding for butter. If a man were trying to feed for milk he would feed for skim-milk. I believe that a person, in feeding for milk, is feeding for lean meat, since the cow has gotten to her level, and is being fed for overflow of the milk pail. We lack nitrogen. Where shall we get it? If we can raise peas we can get it on the farm. Prof. Hills spoke of the combination Mr. Robertson of Canada proposed, and said that

much stress had been brought to bear on the farmers of Wisconsin to get them to raise peas. I have no faith in Mr. Robertson. I mention this to show that there is a feed having these qualities, and doing fairly good and profitable work, if the cow be fed up to about her full capacity. How many dairymen there are who don't think of this—feeding up to her full capacity. Here is a man who has fed ten cows all summer till they are dry. What is the matter? He is feeding hay; he is feeding a one-sided ration to the cows, and hardly enough of that to carry them through till spring, until they come in. How shall we supply the protein to balance up this important corn crop, and since we must buy it we might as well talk about purchased foods for the dairy. I have seen men go to the mills and buy food for the dairy, taking that food which is abundant in starch. Now I think it is a mistake, for we get very little protein. We are gaining nothing there, as a matter of economy. A few years ago people were opposed to flaxseed as a feed, for it made lean meat. The very best, most rich in fertilizing value, of the grain was dumped into the river, and while these waste products were going to ruin, our farmers were trying to restore the fertility of their farms. How shall we restore the fertility of the farm is a question that comes right in here in supplying food for the dairy cow. Now these foods that we lack are rich in nitrogen. The animal wants it, and the land needs it. Now I say a wise farmer buys these waste products that are rich in protein and nitrogen, such as cotton-seed meal, gluten meal, etc. I want to say that in handling our foods for the dairy cow, we must be regular—we must be *regular*. We ourselves want our meals regular—it is the same with the cow. They want a change. Week before last I went to a place where they had five hundred pigs of all ages, and every week sent some to Boston for ten cents a pound. This shows what can be done in Vermont. I don't like pork—we don't use it—don't have it in the house—but still as a business, we may see what can be done. This man was a skilled feeder, and in this lay all his success. Now he believed in giving them a change of feed every day; and such a change cows need. For the health of the cow feed rowen, peas, corn and hay. With their food they should have water regularly, and a little salt every day. We should waste

no food on lousy cattle. I hate to mention it, but I have recently heard gentlemen discussing how to get rid of lice on cattle. Cattle won't be lousy if they are properly cared for. We are a cultured people, and there is culture among cattle. At the Bay State Fair a few years ago, it was a pleasure to see the fine cattle on exhibition there—such beautiful, sleek, well kept cattle, that they were much admired, even by those beautifully dressed city ladies. No one asked if those cattle were lousy. Now I have an item here given me by Bro. Vail that gives a little idea of the butter question. The butter contents of a ton of hay is 65 lbs.; of an acre of corn 225 lbs. Now this does not tell us how much we get from the hay or corn, but it gives us an idea of their relative value. The butter content of a ton of cotton-seed meal is 225 lbs. It shows the butter content of these foods, as I have said, but of course we could not make butter from any one of these foods exclusively, but by combination.

I want to say a word about starvation. The man who carries his cows through the year without their gaining, has given his summer crop to transplant them from fall to spring. Now if these cows had been in milk and had had proper care and feed, they would have been very profitable, but they must have care and feed to be profitable. In buying these feeds or by-products, we get our fertility. How much fertilizer do you suppose is bought in this State in a year? I give as two examples: one firm selling 13,000 tons, and another 20,000 tons. Now here is the fertility to buy. I believe that for every ton of cotton-seed meal I buy I have gained $20 in real estate, and have no more taxes to pay. A farmer who is growing richer now you will find, is doing it by these methods. Farming depends upon the business capacity of the farmer. I met a lady whose husband died and left her with four little children, whom she could not bring up in the village, but might on the farm. Week before last it was my pleasure to be on that farm. It is a well kept, well managed farm, where with thirty Jersey cows she is meeting her payments and running the farm, and has kept her little family together. Now she believes in skilled dairying.

## DISCUSSION.

Mr. Davis—How long should a cow go dry?

Mr. Vail—In my practice in dairying, I like a cow to go dry about two months; but as an exception to that, I know of a cow making a great test that was milked the year round, but the next year she did not do so well.

Mr. Hollister—How many times a day should a cow be fed?

Mr. Sanford—A cow should have enough, but if you feed her a full ration, before she gets it all eaten up she breathes all over it and it is not so fresh. It is important to keep the mangers clean. I am distressed to see a barn which is not clean. I keep a clean shovel to put the feed in with. In the morning we milk first and then put in a little hay, what they will eat while we are eating our breakfast. It is natural for a cow to drink after eating.

Mr. Vail—I have the Buckley watering tubs.

Question—Do you give warm water?

Mr. Sanford—No, but if a cow has to go out and get cold, give her something to warm her—even if she has to have whiskey. I feed some more hay after breakfast and then feed oats and peas. We get through feeding about nine in the morning and then don't feed again until night.

Mr. Smith—Dairying seems to be the subject of this discussion, and if we have cows we must raise calves. Many of these people don't have creameries, or carry milk to creameries—but still we have trouble in raising calves, after having tried various methods. Can you give us any information in that line?

Mr. Gabrilson—We have been very successful in giving rennet. We begin when the calf is put on skim-milk and give rennet with every meal.

Mr. Smith—How do you feed the rennet?

Mr. Gabrilson—We feed in the shape of lozenges. It is in the same shape as that sold for making cheese. We dissolve it in

water, put in the milk and feed as soon as possible, for the milk would begin to thicken or coagulate as it does in cheese making if allowed to stand.

Mr. Smith—Are you speaking of creamery milk?

Mr. Gabrilson—No.

Question—How soon do you begin feeding calves?

Mr. Gabrilson—When they are four or five days old.

Mr. Hollister—How much do you feed?

Mr. Gabrilson—I should say four or five quarts.

Mr. Hollister—Too much milk makes calves sickly.

Mr. Gabrilson—Yes, and you must regulate its temperature. You must have the proper temperature or there will be trouble, and you will find the milk, as it leaves the Baby Separator, about right for the calves.

Mr. Smith—I suppose creamery and cold setting milk are about the same. Don't the calves need a little feed with it?

Mr. Gabrilson—We feed this milk and with it a little oat meal.

Mr. Smith—How do you feed it?

Mr. Gabrilson—Dry. We feed in the trough and the calf eats it slowly.

Mr. Vail—You don't begin to feed at a very early age, do you?

Mr. Gabrilson—No. They won't eat it until they begin to ruminate. I prefer oat meal.

Mr. Sanford—There seems to be very wide-spread and prevalent among the calves, a disease called white scours. Mr. Smith over in Lamoille County told me of a case where the two calves had no milk except as they took it from the heifer. I would like to ask Mr. Fisher what remedies he has tried?

Mr. Fisher—I will offer a hundred dollars to any one who can give me a remedy for this disease. It begins within from twenty-four to thirty-six hours. Sometimes the calf takes a little nourishment. When the cow is on grass there is no trouble, but only after the first of October, when we have difficulty in raising one calf in ten. It is not over-feeding, for we have tried in so many directions to determine what it is. I think it should be referred to the United States government for aid. It is not because the cows are over-fed, I am certain.

Mr. Gabrilson—Are the calves vigorous when born ?

Mr. Fisher—Yes, strong and healthy, and will take nourishment if they can get it. Our veterinarian at Burlington advises sweeping them out, as he calls it, by giving a little castor oil. I have tried it and lost them. There is only one left out of seven or eight.

Mr. Gabrilson—Have you ever tried rennet ?

Mr. Fisher—I have not tried that.

Mr. Fisher—I believe abortion is similar to this. When the calf was dropped, it got up and sucked and seemed to be all right when it died. I don't think the milk was rich, we had others that came in in the same way. I believe the trouble was in the milk. I stopped feeding the milk and it was all right.

Mr. Spear—How many years have you had this experience ?

Mr. Fisher—For the past three years.

Mr. Spear—Does it seem to confine itself to individual cows or the offspring of individual males ?

Mr. Fisher—There have been two males used in the time with about the same results. The cows are all about the same. I fail to raise the calves in the fall and winter.

Mr. Spear—Do you lose all these from this trouble exclusively ?

Mr. Fisher—I have, but I am a little hopeful because the hired man is raising one which appears all right.

Mr. Spear—Have you ever tried soda ?

Mr. Fisher—I never have.

Mr. Winslow—Did you ever try reducing the milk with warm water ?

Mr. Fisher—We have tried it and I did not think it was best.

Mr. Winslow—It might be that the milk was too rich. It naturally contains more water in the summer.

Mr. Spear.—I am glad this subject has come up, and I am glad to hear what this gentleman has done. I do not know whether it is a prenatal condition, or a condition of the milk at the time. But there is one fact that I have found out, and that is, that the offspring of some males is much stronger than that of others. I don't think it was the milk or condition, of the cows that caused this trouble to follow him up for two or three years and then leave

him. I found out that when calves were suckling if the cows were turned out to grass and the hungry calves had a full feed, they were dead calves.

To change the subject and return to lice: I don't agree with my friend Sanford. I don't suppose that I have had the experience that he has had. I have seen lice on Holstein cattle that were well cared for and fat; and a veterinarian who had practised near a large city, told me that they were on cattle sometimes, even with the best of care. It is a contagious disease. Just as soon as one of these insects gets on an animal it reproduces, no matter whether the animal is healthy or not. It is a fact that lice will produce bad condition, they being the cause, not the effect. I tried several things but since using kerosene emulsion I have never had any lice on my cows.

Mr. Sanford—I won't take exception to anything Mr. Spear says. He believes that lice are the cause and not the result. In my experience with lousy cattle the hair looks poor, and they never have that healthy appearance which other cattle have. I had a lousy cow and could never get her fat.

Mr. Gabrilson—I wonder whether the calf that comes under the conditions we have talked about, had a healthy mother.

Mr. Fisher—Yes, they are all healthy.

Mr. Gabrilson—We are losing sight of the question. We reduce the vitality of the cow, and the milk, as is said, becomes injurious to the calf. But the fact that the calf shows symptoms of disease at the time of birth is a sign of disease, and I think we have to look to the mother. I have had no experience in what you speak of, but I should have no hesitation in using rennet. It helps the calf's stomach. For many years I have practised the idea of giving an egg to the calf as soon as born. The lime of the egg shell furnishes lime-water very abundantly, which is beneficial to the calf. I would like to have you try the rennet remedy.

Mr. Spear—To return to the lice. I have been wondering if feeding has any effect on them. Oil meal and a good many things are said to destroy them.

Mr. Ashburn—In Iowa we have no such trouble with the calves, except in want of uniformity in feeding. We have not this trouble

we hear of to-day. We have perhaps very few fine bred Jerseys. What class of cattle are troubled with it?

Mr. Fisher—Jerseys.

Mr. Smith—I think it affects every kind of cattle.

Mr. Ashburn—Let me ask you what time you feed?

Mr. Fisher—We feed twice a day.

Mr. Ashburn—Do you use a thermometer?

Mr. Fisher—No, I test the warmth by my finger.

Mr. Ashburn—Now let me give you a little experience. My son who helped a man at Chicago, was set to warming some water, and when he got a thermometer, the man told him he needn't go to that trouble, for he always told the heat by putting his finger in. He asked the man to test it that way and he got 14° out of the way. Had these cows been milked right up to their time of calving?

Mr. Fisher—No, they had been dry a few weeks.

Mr. Pike—How did you feed when dry? I was in a gentleman's stable a few weeks ago, and he had a nice herd of full blood Jersey cows. I asked him how he raised the calves, and he said he used to have trouble, but now he reduced the milk and had no trouble in raising the calves.

Mr. Winslow—I used to have trouble in raising calves in this way, but don't now. I believe that the trouble is in the digestion of the calf, and in the milk. I take a calf when it is a few hours old, and I have three ways to work if it shows any signs of trouble. I change the milk or reduce the quality of it, and I don't lose a calf now. It is a matter of twenty-five dollars to me as soon as the calf is dropped, and it was very discouraging. I think if you change the milk, give it another cow's milk, you will have less trouble. I have known this trouble to take one the day when dropped, and then it would die the next. I have had a little less trouble by putting a little warm water in the milk. I use a little soda, and change the milk, and give them a little rennet if troubled with the scours.

Mr. Ashburn—If dilution is necessary, wouldn't a calf from a cow that was very rich in milk be more apt to have trouble than from a cow not so rich in milk? Is it the case with those who practice this that they find the milk too rich and needing dilution?

Mr. Winslow—I have had better success in warming my water and diluting the milk. Anything that will save calves is what we are after.

Mr. Pitkin—The best success we have had in saving calves is this: I give them new milk for about two weeks, then I set it in the Cooley cans and give them the skim-milk with a little of Stuart's concentrated feed. I think it is a pound and a half of that with the same amount of bran; mix them together and use about a gill for each calf. Put in a pail and pour boiling water on before adding milk. We are somewhat mixed as to these two kinds of scours. With this feed I have tried change of milk, and I think reducing with water the best way.

Mr. Arms—Cows without exercise will have weak calves.

Mr. Sanford—My cows have exercise and I don't lose any calves.

Mr. Fisher—I lost calves from cows that had been running out.

# AMERICAN EXPERIMENT STATIONS AND THEIR WORK.

The Experiment Station movement originated fifty years ago in England. Two wealthy gentlemen, Sir John B. Lawes and Dr. J. H. Gilbert, associated themselves together in 1843 and began to make experiments in agriculture. They were among the first to systematically apply science to agriculture. During the past summer a monument has been erected at Rothamstead in a field which has been for fifty consecutive years devoted to experimental agriculture, and the two men who early in life were the pioneers in this line of work were both alive, healthy and hearty, to receive and respond to this testimonial from those who had followed in their footsteps. In 1851 a band of German farmers in the vicinity of Mockern, Saxony, joined their own funds to a small amount obtained from the government and established the first Experiment Station. It soon proved of value, and six years later five had been established; in 1866, thirty; in 1873, sixty-three; and now there are nearly one hundred and twenty in Germany and France alone.

In 1853, Dr. Samuel W. Johnson, present Director of the Connecticut State Station, went to Leipsic, Germany, to study chemistry. Dr. Johnson had been born and reared upon a farm, and he found near Leipsic a German Experiment Station, studied its workings, and, imbued with its spirit, returned to America, with the hope that similar institutions might be established in this country. On his return, however, he found the plough-shares being beaten into swords rather than the reverse. The time was not ripe for such a movement, and nothing was done.

In 1869, Dr. W. O. Atwater, a native of Burlington, in our own State, a graduate of Wesleyan University, at Middletown, Connecticut, having served a post-graduate course under Dr. Johnson, went to Germany for the express purpose of the further study of Experiment Stations. In the latter part of 1873, Dr. Johnson and Dr. Atwater first addressed a body of Connecticut farmers at a

meeting of the State Board of Agriculture, urging the establishment of an Experiment Station. The idea was not well received at first, but, through the liberality of a private individual, joined to a small appropriation from the State, the first American Experiment Station began its work upon October 1st, 1875, as the State Agricultural Experiment Station, at Middletown, Connecticut. It quickly proved itself of use. The next year, California, the year following, North Carolina, and then in rapid succession, New Jersey, New York, Massachusetts, Wisconsin and other States established stations. In 1886 the Vermont State Station was established by act of legislature. In the meantime the national government took the matter up, and by an act, commonly known as the "Hatch Act," approved March 2, 1887, Agricultural Experiment Stations were established in all the States and Territories in the Union, to be connected with the Agricultural Colleges of the States. The Hatch Act is still in force. Through its provisions the Vermont Station, in common with others throughout the country, receives annually an income of $15,000 for the purpose of experimenting in agriculture. The financial report of the Station, indicating the classes of expenditures, is annually sent to the Secretaries of the Treasury and of Agriculture, and to the Governor of the State, and is printed in the yearly report. The State grant expired in 1890, since which time the Station has received no income from the State Treasury.

The Hatch Act gave a wonderful impetus to the work of agricultural investigation in this country. There is now an Experiment Station in every State and Territory, except the Indian Territory and Alaska. There is over $750,000 a year appropriated to these Stations, the funds coming from the money accruing from the sale of unoccupied government lands. It is the largest governmental scientific enterprise ever started, and the publications of the Stations reach nearly half a million of farmers direct. Most of the Stations have kept quite free from politics, most of them have fairly efficient workers, and have achieved practical and useful results. The sum appropriated seems very large, yet it is but about 1¼ cents per capita for the entire population of the country. As above noted, none of the funds come from direct or indirect taxation.

The Stations are now about six years old. They were at first hampered by a lack of men and of material. The necessity of the immediate manning of forty new Stations, and the lack of trained men to fit the places, caused at first the publication of a good deal of rather crude material. They were also hampered by the general desire on the part of the farming communities for immediate results, as well as by the prejudice, in many localities, against so-called "book-farming." As the Stations grow older, however, their constituencies realize more fully the fact that an agricultural experiment cannot be finished in a day, and as time goes on, enabling the publication of the results of long experiments, criticisms have grown less frequent.

The objects of the Station may be grouped under five heads :

1. The Stations are bureaus of information on questions of practical interest to the States in which they are located.

2. They test new devices, tend to improve the methods of agriculture, aid in the introduction and study of new crops, the improvement of live stock, and often help in the establishment of new agricultural industries.

3. They aid the farmer in his contest against insects and plant and animal diseases.

4. They defend the farmer against fraud in commercial fertilizers, seeds and feeding stuffs.

5. They investigate the operations of nature in the air, water, soil, plant and animal, and endeavor to find out the principles applied to the betterment of the processes and the products of agriculture.

In general, it may be said that their object is to make a regular business of discovery for the use of farming, to promote agriculture by scientific investigation and experiment, and to devise as well as to increase knowledge. The Stations promulgate this information by means of bulletins and reports, which are sent free to any address upon application. They also make large use of the agricultural press, send out newspaper bulletins, and their officers attend and address farmers' institutes, grange meetings, etc. The stations frequently make educational exhibits at State and County fairs; all letters received upon agricultural topics are carefully

considered and candidly answered. In general, it may be said that through the bounty of the Government, the intelligence and energies of a staff of trained specialists in agricultural lines is placed at the service of every individual in the State, provided that the service required is not of a private nature, but is a matter which may be made public if deemed advisable.

The American Experiment Stations centre in the Office of Experiment Stations, of the Department of Agriculture. This Office collates the work of the various stations, makes digests of their publications, as well as of publications in agricultural lines in all languages, and publishes monthly the Experiment Station Record, containing these digests. The following table of contents from one of these Records picked up at random gives a general idea of the scope of the work. There were one hundred and twenty-four separate topics in this number of the Record, divided as follows: Meteorology, 3; soils, 15; fertilizers, 13; field crops, 38; horticulture, 7; weeds, 2; diseases of plants, 12; insects, 6; animal feeding, 18; veterinary medicine, 2; dairying, 6; sugar, 1; agricultural engineering, 1.

The Experiment Station Record is sent free to any address upon application. It is the resume of Experiment Station work in this and other countries. It seems to me that to the intelligent agriculturist this publication should be of much more interest than any magazine now issued, and I would strongly urge my readers to drop a postal card to the office of Experiment Stations, Department of Agriculture, Washington, D. C., that their names may be put upon the mailing list to receive this publication. The reports and bulletins of most of the stations are sent to residents of other States free of charge upon application.

This hand-book of Experiment Station work, contains an account of the work of all the Stations, has references, arranged alphabetically, so that any one can find it. Let us turn to Maple Sugar, the Vermont product, and we find on page 98, a half page dovoted to Maple Sugar. This Station is the only one that has done work on this line. It refers to our bulletin, No. 26, on the subject, and anyone interested can find the reference where he can send for the full data. In my opinion there is more agricultural knowledge in

this hand-book than in any publication I am acquainted with, and is at the service of any one who wants to write for it.

The work of the Vermont Station has been published in seven reports and forty-two bulletins. Our present mailing list is in the vicinity of sixty-five hundred, mostly in this State. Back reports and bulletins are free for distribution so long as they last.

The field of agriculture is so broad that no one Station can hope to cover it, and therefore the Stations generally take up only such lines of work as are of local interest, and concentrate their work on a few rather than diffuse it over many things. The main lines of work of the Vermont Station are as follows: Fertilizer control, plant diseases, maple sugar making, investigation of tuberculosis, and dairying, taken in its broadest sense to cover the growing of crops, feeding of animals and the handling of milk. Under this latter head may be mentioned the publication of a milk test, second only to the Babcock; and the publication of the results of three dairy school tests of dairy apparatus; the comparison of various grain feeds and of the various methods of preserving and feeding the corn crop; the investigation of creamery practices and products, and many others too numerous to mention.

Among the many valuable results of Experiment Station work in other States may be mentioned the Babcock test, devised by the Wisconsin Station; investigation of the effect of bacteria upon milk and cream, by the Connecticut and Iowa Stations; the exhaustive investigation on cheese making at the Geneva, New York, Station; the sugar work of the Louisiana and Nebraska Stations, and many others. Perhaps as good an idea of the work of the Stations as could be gained by the non-technical observer, was seen in the collective exhibit of the Experiment Stations and Colleges at the World's Fair. The Association of American Agricultural Colleges and Experiment Stations resolved, in 1890, to make a collective exhibit at the World's Fair, and much time and thought was placed thereon. The exhibit occupied a quarter of an acre in the southwest corner of the Agricultural Building. Hon. W. I. Buchanan, Chief of the Agricultural Department of the World's Fair, did not hesitate to call it the best exhibit in his building, and it was his habit when visited by any person to whom he wished to

pay particular attention, to take him at once to the College and Station exhibit. It was a great object lesson of the way in which these institutions executed the trust reposed in them. The exhibit attracted much attention. It was not a complete exhibit of any one College or Station, but each contributed samples of its equipment and work, which were classified and arranged under several headings. It was much as if one good College and one good Station, of an extra wide scope, showed all it had. The exhibit was well labeled with descriptive labels, indicating in each case what the exhibit was and what it taught. There were connected with the exhibit a working agricultural and mechanical laboratory, in which analyses of fodders, fertilizers, milk, water, etc. were going on most of the time, and a working botanical and bacteriological laboratory, in which research was being pursued. The exhibit was manned by details of officers from the various Stations, whose duty it was to explain the exhibits to visitors. There were alcoves devoted to dairying, animal nutrition, soils, crops, botany, plant diseases, animal diseases, biology, bacteriology and other lines of investigation. There were thousands of photographs showing experimental results and Station equipments. There were full sets of all Station publications, and, in general, the best results of American Station enterprise was, so far as possible, graphically set forth. A few examples will indicate to some extent what was shown in this exhibit.

As the years go by there is reason to believe that the Station and the farmer are coming nearer together. The increasing number of inquiries on agricultural topics received each year, the growing mailing list, and the kind words written and spoken, lead Station workers to believe that their work is of value to the farmer. They are mutually interdependent, and each do their best work when aided by the helpful advice of the other. May their union in endeavor long last.

In the Soil Alcove were the typical soils of the country in glass cases, so that one could look through and see the vast difference in the composition of the fertile, sterile, sandy, rocky, and loamy soils.

There were many things in the Dairy Alcove, of interest to a dairy State like Vermont. There were glass jars containing the various substances of which milk is made up, so that the eye could

take in at a glance the *composition of milk.* There were 100 pounds of the original milk ; then in the next glass jar 87 pounds of water, in the next 4 pounds of fat, then 25 pounds of casein, 0.7 pound of albumen, 4.95 pounds of milk sugar, etc. The same exhibit was made of the various ingredients of butter and cheese. The various testing methods were also shown, including the original Babcock machine.

Bacteria as applied to dairying : Cases of bacteria, and method of generating germs was shown. Many diseases are due to the action of germs, microbes, or bacteria. There are germs which are injurious to life, and some that are great blessings. In milk lines there are a certain set of germs or bacteria which produce very fine butter, and others which produçe very poor goods. The innoculation of cream with aromatic germs has become a regular business. This seems fanciful, but it has been done in Denmark ; they are doing it now and selling their butter at top prices. Good butter and bad butter are mainly matters of good or bad germs.

In the Botanical Alcove, we find botany as applied to agriculture. We find, graphically indicated, methods by which plant diseases may be combatted. This is shown by pictures of treated and untreated fields of grain, potatoes, etc., and by charts, by specimens of plants, etc. Oat smut and various smuts peculiar to the West were shown by actual specimens, as well as by pictures, and many specimens of weeds from all sections of the country were also exhibited. The botanist of New Jersey had what he called the 200 centuries of weeds ; dried and in bottles there were 200 specimens. There was a label on each, with name and how best eradicated. In this exhibit were plants that are nitrogen gatherers. It has been found that plants like the clover, bean and pea, have the power of taking nitrogen from the air. If these plants can take from the air, where it is free, the most valuable of all ingredients, it is like digging in a gold mine. The great renovating power of clover is due almost entirely to its ability to take the nitrogen from the air. This valuable property is due to the power of small tubercles and the roots. Plants having these nodules can take from the air nitrogen, while plants that do not have them cannot thus avail themselves. In this exhibit the plants, roots, etc., were spread out and arranged so these properties could be seen.

# HORSES.

## EAST BETHEL INSTITUTE.

Mr. Winslow—It is not easy to take a hopeful view of a business that the public generally declare has gone to pieces. Every industry has its hard times, and its prosperity. There are always men who flock into a new business that seems likely to make them speedily rich, and as soon go out of it when the tide turns. There are some views of the horse business that are encouraging even in these times. Horses are necessary for our business. We must have them, either by purchase or raising. Vermont horses have always been in good demand for road purposes. The right kind are sought after to-day and at paying prices.

There are several reasons why horses are low in price. Electricity has displaced the horse car lines, stopped demand for the ordinary horse, and thrown large numbers back on the market. The high price and active demand for all kinds of horses has influenced almost everyone who has a mare, to try to raise a colt. This has been done without any definite idea in the matter except to raise a colt, knowing that it would find a ready sale.

The amateur farmers in all parts of the country have gone wild on raising trotters for sporting men. This has been done with the one idea of producing a record breaker, regardless of every other qualification. It is only now and then that their skill can produce a fast horse, which has left a lot of undesirable ones to be thrown on the market, so that the market is overloaded with all sorts of horses that no one wants, which of course injures the market for desirable ones, since very often a man wanting a horse of a certain type, for which he finds himself obliged to pay a fair price to obtain, will take a somewhat undesirable one at a much lower price and save his money. The result of all this is to stop the breeding of horses, and in a few years, when the present supply is worked off they will be high again.

There has always been a demand for good road horses of Morgan breed, build, etc., that stood from 15 to 16 hands high, of chestnut, bay or brown color, that could trot a mile in three minutes or travel eight to ten miles in an hour.

There is a something about a Vermont Morgan that you cannot get in any other horse or in any other country. Whether it is the soil, the climate or the air, that gives them these desirable qualities, I am unable to say, but I know they can find the like nowhere else, and buyers have told me this winter that they could not find enough such for their customers, that they could get just as good horses, to look at, from the West, but not such as suited; that they did not dare let a customer take a Western horse to keep a while on trial, but were always willing to do so with a Vermont horse, because the longer they kept them the better they liked them.

The popularity of the Vermont Morgan, with the demand for a larger horse, has led speculators to try to introduce French Coach Stallions, as a means of improving the Morgan.

There are several reasons why our farmers and horse breeders should steer clear of the whole thing. It is a speculation to unload a horse at many times his value. They go into a town with a French Coach Stallion, get up a stock company and sell the horse on the installment plan, getting enough down to pay all the horse is worth, and holding notes for the rest. In this way they have unloaded horses at twenty-five hundred dollars each that were not worth over five hundred if they were all they were claimed to be. The whole thing is a mistake from a breeding standpoint, allowing everything to be as claimed and at a fair price. The horses of Vermont are somewhat similar in blood, tracing back in common with the various families of Hambletonians to a common ancestry, so that in whatever way the farmer crosses his mare, either to Morgan or Hambletonian, he is still within the family lines and gets a somewhat similar colt; but when he breeds his mare to a French Coach horse he is introducing a foreign element that destroys the equilibrium of the blood lines, and he can form no opinion of what he will get. The whole union is so dissimilar that the result is liable to prove a sport. It may be of value and it may not. It is wholly an experiment. Then, again, the union of so

large a horse on our small mares is liable to produce a long-legged worthless colt. The cross is too rank.

It is a well known fact in breeding that it takes several generations of the union of horses that are of dissimilar type and breeding, before any degree of uniformity can be obtained, and then it is quite as likely to produce a style of horse different from either.

I have seen only the first cross of French Coach on Morgan mares, and as a rule they were undesirable, and different from either. Perhaps the second cross might incline toward the type of the French Coach, but in no place have I seen them as serviceable horses as without the French Coach blood.

Vermont is noted for producing a desirable type of road horses and gentlemen's drivers. They are being picked up as fast as they are ready for sale. They are just what the farmers need to do their farm work. Then why experiment in some unknown blood, why not let well enough alone and stick to what we know is all right and satisfactory, and produces what the public demands and is willing to pay for.

I was proud of our Morgan horses when I saw them in the ring at Chicago beside horses of any and all breeds, and came home more in love with the grand old Morgan stock than ever.

The following is a clipping from the *Chicago Record*:

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VERMONT MORGANS AT CHICAGO.

If you want to see a handsome collection of Morgan horses from the State that gave birth to Ethan Allen, don't overlook the Vermont exhibit in the live-stock show.

For example, there is that grand stallion Denning Allen, 19 years of age, who Friday captured the first prize for stallions 5 years old and over, as well as in the sweepstakes. The horse is the sire of Lord Clinton, (2:10¼), and is himself grandly bred, his sire being Honest Allen, he by that famous old horse Ethan Allen. The dam of Denning Allen was Rena, by Ward's Flying Cloud, by Black Hawk. The stallion is a mahogany bay, and despite his age is a splendid animal of sprightly action. Jessie, his stable companion,

also took first prize for mares 5 years old and over. She is a handsome chestnut, by Daniel Lambert. These horses are owned by Joseph Battell of Middlebury, Vt., and they are ably cared for by Patrick McMahon.

There is also to be seen a beautiful 5 year-old daughter of Ben Franklin, owned by H. T. Cutts of Orwell, Vt. She was disqualified from competing in the premium classes because she had never produced a foal. This mare has all the beautiful characteristics of the Lambert branch of the Morgan family, while she has shown three miles better than 2:30, and quarters in 35 seconds.

Charlie Ray, winner of the second prize in the 5-year-old and over class, is a magnificent stallion, belonging to F. C. Williams of Coventry, Vt. This horse has a remarkable record, and here it is. He has trotted in 2:29 on a half-mile track, was second to Alcander in 2:22½, has won more races in Vermont than any other horse, and was in the list of $1000 winners for 1892. He trotted in seventeen races this year; won nine first moneys, four second, three third and one fourth, starting in every race entered. Just before he came to the fair he trotted three heats, all better than 2:26, at White River Junction.

D. K. Wakefield of Danville, Vt., shows Fred Lambert, a stylish three-year-old stallion, winner of the fourth premium in his class. He has taken three first premiums in Vermont, and is splendidly bred, being sired by Cobden, one of the best sons of Lambert, dam Topsy by Vermont Ranger, second dam, the dam of Helen M., the fastest two-year-old in New England. Fred Lambert is a fine looking bay and when matured will make a splendid animal.

Gratian is a handsome bay animal, belonging to W. S. Bailey of Hardwick, Vt., is 4 years old, brother to Lambert B., fastest stallion of the Lambert family, and dam by Messenger Chief. He captured fifth place for 4 year-old stallions.

Another prize winner is Tamerlane, owned by Lester Fish of Rutland, Vt., and the recipient of the fourth prize in the four-year-old stallion class. He was sired by Aristos, dam Empress. He has a record of 2:29 as a three-year-old. As a sucker and as a two-year-old he took all prizes, winning races at each age. With proper training for the track his record would undoubtedly be a

wonderful one. He is a brother to R. D. F., who recently sold for $5,000. Mr. Fish values this horse at $10,000.

Young Daniel Lambert is a good looking horse that won the first premium for four-year-old stallions and fourth in the sweepstakes, and is owned by Ballard Bros., of Georgia, Vt. When one sizes up the points of this horse he is not surprised at the good showing made by the animal. Young Daniel Lambert is well bred, his sire being Allon, his dam Lady Alice, and he is a pure open-gaited trotter.

Wide-awake, also owned by Ballard Bros., got seventh in the five-year-old stallion class.

This article would be incomplete without reference to Meteor, the handsome brown stallion, 10 years old, who won second money in the sweepstakes, in which forty horses were entered. His sire was Young Rex, dam by Peacock. Meteor has a fine gait in harness, and his owner, S. H. Soule of Fairfield, Vt., is naturally very proud of him.

Hill's Bonny Morgan, owned by W. H. Hill, another Vermont man, is a noteworthy animal. In style, color and disposition he is a reproduction of famous old Justin Morgan, though he weighs 100 pounds more and is three inches higher.

All in all, the grand old State of Vermont may well be proud of the showing her horse-owners made at the fair.

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From the *Middlebury Register:*

### VERMONT MORGANS AT CHICAGO.

Vermonters took 25 of the 46 premiums offered for Morgan stock at the World's Fair, Chicago. The awards were made on Friday. Kentucky got seven, Illinois eight and Indiana six. These were the Vermont winners:

Section 1—Stallion, five years old or over: First, Joseph Battell of Middlebury, Denning Allen; second, F. C. Williams of Coventry, Charlie Ray; third, S. A. Hall of Fairfield, Meteor; fifth, Joseph Battell of Middlebury, Thought; sixth, W. H. Taft of

Vergennes, Black Hawk; seventh, Ballard Brothers of Georgia, Wide-awake.

Section 2—Stallion, four years old and under five: First, Ballard Brothers of Georgia, Daniel Lambert; second, Ross C. Kinsley of Lowell, Alumni; fourth, Lester Fish of Rutland, Tamerlane; fifth, W. A. Bailey of Hardwick, Gratian; sixth, George Sennett of Lyndonville, Morgan Chief.

Section 3—Stallions three years old and under four: Fourth, D. K. Wakefield of Danville, Fred Lambert.

Section 4—Stallions two years old and under three: Second, W. H. Taft of Vergennes, W. H.; fourth, D. R. Smith of Washington, Cobden S.; fifth, W. J. Donnelly of Wolcott, Ben Allen.

Section 8—Mare five years old and over: First, Joseph Battell of Middlebury, Jessie.

Section 9—Mare four years old and under five: Third, R. J. Cole of Danville, Alms.

Section 10—Mare three years old and under four: Second, J. H. George of Hardwick, Bettie; fourth, W. S. Bailey of Hardwick, Montie.

Section 11—Mare two years old and under three: Second, Joseph Battell of Middlebury, Abbie; third, Lester Fish of Rutland, Lucille; fourth, H. C. Preston of Vergennes, Lady Black Hawk.

On Saturday the following additional premiums were awarded:

Sweepstakes for stallion, five years old or over: First premium, Joseph Battell, Middlebury; second, S. H. Soule of Fairfield,

Mare of any age, Joseph Battell of Middlebury.

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Mr. Gabrilson—This is my first visit to New England and after seeing the men and women of Vermont, nothing has interested me so much as the horses. It carries me back to my early days in Wisconsin, where many of your best horses were brought and have left their impress on the horses of that State. Every kind of horse has been brought into the West, but every now and then one can see the familiar form and face of the Morgan horse, which has descended

to these horses. I think the Morgan horse is entitled to praise. I understand that you have been breeding, as we have in the West, hit or miss, and it is time to call a halt and breed for a special purpose. The Morgan horses I see here are smaller than those I was familiar with forty years ago. Whether this is due to your conditions or to your breeding, I don't know. There is one thing you might do, as has been done in many places in the West. An association is formed there among the farmers, and they have a good stock horse, and use only good mares. This has brought up the product, and when a buyer comes along it is not difficult to find a horse such as he likes. I understand that there is a movement in Vermont to see about a Vermont Morgan Horse Register, and I hope the Morgan horse will be brought back to its old time vigor.

Prof. Jones—I should like to ask a question, although I am not in the horse business. Does there still remain enough good Morgan stock in the State, so that if there were a sentiment to do it, they could be brought back to the standard they had?

Mr. Winslow—There is in the State a fine class of horses, but they are not the majority. When you find them you have to pay for them. I have on hand an order for four horses, nothing fancy, but just our Morgan horses. They are found here, but just as soon as you find one you sell it. The price is too high. I would breed a horse that the people want for stylish driving, and if not good for driving, I would put them on the plow. There are three kinds of horses that we can breed—trotters, drivers, workers.

Question—Did I understand that you would choose the mare rather than the horse for reliability in disposition, of offspring?

Mr. Winslow—That is my idea.

Question—I had a mare that was perfect as far a reliability was concerned, but she could not travel fast. She could not go to the depot, a distance of only five miles, in an hour. I served that mare to a horse in Randolph one year, also the next year, and had a pair of colts that matched almost perfectly. I could work these horses anywhere, and my son drove them to Rochester, 18 miles from here, with four in the wagon, in an hour and a half. I could plow with them, but they were quick and active and I had hard work to

keep up with them. They were not reliable to leave standing, although they were if you had hold of the lines. Now the mother was perfectly reliable. Why should these colts not inherit her disposition ?

Mr. Winslow—There is a law of inheritance that comes in here, and so I would choose a mare with the qualities I desired, running just as far back as possible.

GEORGIA INSTITUTE.

Question—What do you think of the Cleveland Bay.

Ans.—They are stylish, handsome horses, but have never grown popular. They are lacking in that enduring road quality which is so common in the Morgan.

They drive very finely for a short distance and then seem to lose all their energy. They are only for show.

Mr. Atkinson—Are the Percherons gaining favor in this country ?

Ans.—For heavy draft purposes the Percherons seem to give satisfaction. They are livelier and quicker than the Clydes and have not so much hair on the legs. As a rule their feet are better.

Mr. Bliss—Is the quality of the Vermont Morgan the result of our soil, climate and feed, or of its blood?

Ans.—Soil, climate and food affect the size, but the real horse is cultivated by the mind of the breeder. This is done by the natural law of survival of the fittest.

The Vermonter as a rule wants a smart, trappy horse, and in long years of constant breeding, the horses gradually assume the type he selects to breed.

Mr. Loomis—What do you think of in-breeding animals ?

Ans.—The tendency is to weaken the constitution, and decrease the size.

Mr. Wilcox—I know a man who bred several colts from a mare and every one showed weak knees. What would you do for this ?

Ans. Don't breed her. Inherent faults must be guarded against. The dam may be perfect, but farther back you may find a line of stock with weak or faulty organism. As soon as a mare proves not to be a valuable breeder from any cause it is wise to stop breeding her.

HARTLAND INSTITUTE.

Mr. Gabrilson—In the West we have a large number of small inferior horses for which we really have no sale. The cost of feed is so much less in the West that it is quite an item in our favor.

Mr. Davis—Do you think Eastern farmers can compete with the West in breeding draft horses ?

Mr. Gabrilson—No ! And more than that, you have a horse in the Morgan, more adapted to your needs and market.

Mr. Sanford—I remember old Gifford Morgan. His stock were the best possible horses for Vermont.

IRASBURGH INSTITUTE.

Mr. Williams—I am in accord with Mr. Winslow's ideas of breeding. The Morgan horse is my ideal for our horses in Vermont. In our exhibit at Chicago, we found our Vermont Morgans standing at the head, and even the Western man, who breeds the big stock, wants just such stock as we are raising and as we ought to raise here in Vermont. Our roadsters are what the country wants and what they will have. We have a gold mine in our Morgan stock if we will only continue to breed and develop them as we can, and we can afford to raise them even now. Orleans county has sold a great many high-priced horses in the last 40 years, and none of the really high-priced stock has been largely tinctured with Morgan blood. Large horses will sell best now, and if I could breed just what I want to they would be 15 to 16 hands high—but sometimes we have to get size at the expense of some other good quality.

Mr. Sanford—Would it be well for breeders to establish a scale of points to breed to ?

Mr. Williams—Organization in such matters is very desirable. We need to be united in this matter. A Vermont Morgan Breeder's association would be beneficial to Vermont horse breeders.

Mr. Root, being called on, said : The words of Mr. Winslow and Mr. Williams have been to the point, and I heartily agree with them in their views of the breeding stock for our State. Without

doubt the time is soon coming when we shall get good prices for a good, well-bred stock of Morgans. Good horses always have paid, and always will pay, a good price.

JOHNSON INSTITUTE.

Mr. Sinclair—How do you feed your colts and horses ?

Oats is a good muscle producing food. I am now feeding all my horses and colts on the floor, and I find it a good thing for a horse to reach down for his food. For work-horses I like to feed cracked corn.

Do you like to feed dry corn fodder to horses ?

I think it would be all right to feed dry fodder for a change.

What do you feed a weanling colt ? Bran and oats and sweet skimmed milk.

Mr. Hayward—Did you ever feed sour milk ?

No. Did you ?

Yes, I have fed a six quart pan of thick sour milk with good results.

Do you think it safe to feed four quarts of oats a day to a weanling colt ?

Yes, perfectly safe. If you feed high you must give exercise at the same time.

Will a colt do well in summer if fed high in winter?

Don't stop your grain feed at once; when you turn out to grass keep it up for some time.

Mr. Beecher—Should horses be watered before feeding grain or after ?

I prefer to water before feeding.

MARSHFIELD INSTITUTE.

Question—Suppose a mare gets a spavin from an accidental strain, would her colts that she may afterwards have be any more liable to spavin than if the dam were sound ?

Answer—If the mare had not been weak in that place she would never have received a spavin. She had the predisposition to weakness in the spavin joint, the strain came, her joint could not resist the strain and it gave way. Her colt may be from a horse that has

inherited a like predisposition, and the result is the colt on the first occasion throws out one or two spavins. There is risk in breeding anything but *absolutely sound* stock.

The reason why it is so hard to find sound horses, is that farmers and breeders paid no attention to the soundness of breeding animals. They thought any old, broken down mare was good enough to raise a colt. Like begets like.

Remark—In regard to spavins being hereditary, I know of a mare that had one, and I can count up sixty of her offspring, only one of which is sound.

Mr. Winslow—I was told a few years ago that eight out of every ten of the inmates of the poor houses in Albany County, N. Y., traced back to one bad woman. I believe, if it were possible to trace the horses in their tricks and defects, you could account for about all we dislike in them, and find them hereditary.

Mr. Pike—Do you think the demand for the general purpose horse will diminish during the next five years?

Answer—I do not like the term general purpose. I think you ought to aim at some quality of superiority, it may be of draft, road, or trotting, and then call the horse a general purpose horse if you like.

I think, if our aim is for strong blocky roadsters of 15 to 16 hands, we are very likely to get a horse that, besides being a road horse, is also fairly good for teaming, and is just about right for farm work.

Mr. Pike—When breeding, would you breed for speed?

Answer—Not for extreme speed so much as for road qualities.

Mr. Pike—Can you get speed without breeding for it?

Answer—About all our horses are bred more or less from fast trotting stock; many of them are great roadsters with good staying quality.

It often happens that from this stock there comes a fast horse without any special attempt, on the part of the breeder, to produce a trotter.

WASHINGTON INSTITUTE.

Mr. Bohanan—The gentleman did not touch on the question of biting colts. How would you advise caring for one that is not being used much this winter?

Mr. Winslow—Keep in a box stall, and feed them a mixed feed and let them exercise in the yard. They will have a long shaggy coat, but it is natural for them in winter. It is a better way to keep them than shod and blanketed all winter. If in a box stall look out and keep their feet cleaned out, for they will get out of order if they stand on their own manure.

Question—A young mare that has never been broken is in foal; would you break her?

Mr. Winslow—No. I should prefer to wait until the colt is weaned.

Mr. Gabrilson—Have you had any experience with the Belgian horses?

Mr. Winslow—I have seen them, but they appear more like draft horses.

Mr. Gabrilson—They are like the Cleveland Bay, and this is a sort of draft horse.

Question—Will you define the meaning of Thoroughbred as applied to horses?

Question—Do you believe in breeding in and in?

Mr. Winslow—I think the constitution is weakened in breeding in and in, with any kind of stock, and I think if carried too far with horses, it would make them worthless.

The Thoroughbred is a distinct breed of running horses, the oldest and most purely-bred race of horses in England. Thoroughbreds are bred almost exclusively for racing purposes. Some of the larger, stronger, and better made Thoroughbred sires are used for getting hunters, and the blood of the Thoroughbred has at one time or another entered into all of our breeds of coach horses. The terms "thoroughbred," "full-blood," and "pure-bred," are generally used in this country as practically synonymous, but as a matter of fact the word "thoroughbred" should not be used except as the name of the breed of running horses, and when written it should

be spelled with a capital letter—thus, Thoroughbred—just as Clydesdale, or Shire, or Suffolk, or Short-horn, or the name of any other distinct breed is spelled. It is a very loose use of the term "Thoroughbred" to apply it to other breeds to indicate their purity of blood, as the word has for years stood as the name of a distinct breed of horses.

Its use in England is properly confined to the running horse, but in this country it has been carelessly employed as indicating pedigreed or registered animals of all breeds. The term "pure-bred" or "pedigreed" should be used in such cases instead of "thoroughbred." A pure bred, in the ordinarily-accepted meaning of the term, is an animal eligible to record in the pedigree register of its breed. Strictly speaking the term is more or less a relative one. The basis of registration varies, but that most generally accepted is the one adopted by the English Thoroughbred Stud book—the first register of the kind established—namely, five top crosses of Thoroughbred sires.

In establishing pedigree records, of course foundation stock had to be agreed on, and in early volumes a less number of recorded sires has been accepted by breed societies, and at this time nearly all pedigree registers for cattle, sheep and swine, accept for record only the descendants of ancestors already registered. The stud books still adhere to the old Thoroughbred standard—five top crosses of recorded sires—but comparatively few horses are recorded under this rule. It is generally accepted, however, that five crosses will serve to fix the type so that it will be transmitted with reasonable certainty; and when the type is thus fixed the animals may be called pure-bred, in accordance with the generally accepted meaning of the term. But do not call animals of the pure breeds "Thoroughbreds;" leave that term to the race horse as its distinct name, and refer to the others as "pure-bred,," "full-blood," "pedigreed," or registered." The most careful and intelligent breeders long since discriminated properly in the use of these terms, but farmers generally have fallen into the habit of designating all registered stock as "thoroughbreds." The use of the term is objectionable for the reasons stated, and it should be superceded by the other terms.

## FAIR HAVEN INSTITUTE.

Dr. G. M. Twitchell of Augusta, Maine, Secretary of the Maine State Agricultural Society, gave the following paper on the scale of points for determining values and making awards. [Republished by permission of Massachusetts Board of Agriculture.]

In the study of any economic problem bearing upon individuals and the State, or between individual and individual, the first thing to do is to come to a full understanding of all existing conditions and surrounding influences.

The danger with men working by themselves in shop, mill, study, or on the farm, is that surely, if unconsciously, they become encased in the crust of habit, the hardest crust to break, the one most difficult to dissolve, and from which there is no relief save friction by contact.

Under this crust old methods and practices appear to be the only ones to pursue. With eyes blinded with this deposit, there can be no other path to prosperity save the narrow one traveled, no implement better than the one used, no class of stock, or individual thereof, more productive or valuable than those on the farm; and worse than all else, no theory so good as the rut followed. The thought gets imbedded that books and newspapers are a curse rather than a help, the writers impractical men, improvement an impossibility, and every one who has broken away from old practices a crank with one idea, who is surely on the highway to ruin.

All about us, in town, village and country, these individuals are to be found, barnacles on the wheels of progress, yet certain that they and their methods are to save the world, if it is ever saved, the "if" in their minds being a surprisingly large factor, while all about the wonderful inventions of men are solving the problems of the day, promoting a higher life and rendering a greater range of comforts possible to the humblest, bringing all the mighty forces to do the bidding of the toilers of earth. The greatest obstacle to be overcome is the opposition of those who would receive the greatest benefit. I repeat, the only salvation for any man is by friction through contact, friction of mind against mind, ideas against ideas, thought against thought. Companionship with individuals

is not to be compared with companionship with ideas. The weekly agricultural newspaper, alive to the demands of to-day, is as necessary for the salvation of the farmer as the golden rule for the salvation of man, the friction of brain against brain as essential in the development of the highest possibilities in any department of farm life as the quickening power of God's spirit to help up the hill of progress.

Get this thought firmly fixed, that education is the fertilizer which alone can revolutionize New England farms. If conditions have changed we must change; if market demands have been transformed we must be transformed; if the great West is pouring its products down at our doors to compete with the home grown, the lesson is that out of developed brain power we may rise to higher attainments.

We are shut out in one direction that our energies may be directed towards the production of something better. The lesson is that universal law of growth. We are not crowded out, but up, if we will but through friction develop the power within us. So I count the present condition and future prospects a blessing to the farmers of New England, who aspire to grow.

He who is content to follow old paths, to keep in the ruts, will be crushed between the upper and nether millstones.

A horse is not a horse simply because it has the general form of that animal, a cow not a cow because she has horns and gives milk. Both are to be measured by their individuality. A clean cut conception of the distinction here indicated is necessary.

It is only through discipline that man preserves his individuality, therefore it follows that by the same is improvement made possible with our animals. Thus as we lose sight of the idea that a horse is a frame with the skin drawn over it, and begin to conceive of the possibilities of the animal in one direction or another, not in all, we begin to divide and subdivide. There follows an ideal of form adapted to purpose, and the work of improvement, through education, has commenced. It is the same with the cow, the sheep, the poultry, the whole range of animal, vegetable and mechanical products.

The primal object of all exhibition and competition should be to fix this ideal of parts with sole reference to purpose, so clearly in the mind that, in measuring, the perfection of each shall decide the question of worth. There has been no desire here to discuss moral or ethical questions, but to present fundamental facts which have a direct bearing upon what is to follow.

We are to-day to discuss the scale of points as a means of determining value, and deciding the question of merit at our agricultural fairs, between animals, farm, garden, orchard, household and mechanical products.

To discuss intelligently the fundamental purpose of these, annual exhibitions must be considered. In the wisdom of the law makers, recognizing the supremacy of agriculture, and the dependence of all classes upon it, it has been deemed expedient to incorporate, in the counties of this commonwealth, agricultural societies for the sole purpose of furthering the interest in agricultural and allied mechanical pursuits, by providing for annual exhibitions, where premiums may be offered and paid on most meritorious animals and articles. To advance agriculture and promote mechanics has been the sole purpose of the incorporators.

If is perfectly safe to assert that under the committee system of awarding prizes, all thought of advancing or promoting has dropped out of sight. Wherever the awards have been made under this plan, the paramount idea has been to beat somebody, not to be educated. Committees have been selected on the grounds, and have too often been exhibitors themselves, and the scramble has been to reach after and win the blue ribbon, regardless of results. This much may be claimed without reflecting in the least upon the honesty or integrity of any individual member of any committee. The criticism stands against the system, and for this reason, that a ribbon or a card does not, and cannot, advance or promote anything but the selfishness and self interests of the fortunate individuals. There can be nothing educative, and education is absolutely necessary for growth everywhere.

The comparative system of awarding premiums is punctured with abuse on every hand. The fear of severe criticism from exhibitors, or the public, renders the position on the committee one to

be avoided. In the presence of a large number of exhibitors in any one class it becomes a delicate and difficult matter to award all the premiums to a single individual, even though satisfied of superior merit, or, on the other hand to pass by a wealthy and influential member, even though his exhibit falls somewhat below. There is wanting something definite, something tangible to which the committee may turn for complete justification. Another objection is the temptation to shift responsibility when criticisms arise.

If the comparative system is to be continued, then one man should make the awards in each class. These objections are manifest and valid, but the chief reason why the State, through the Board of Agriculture, should require a different system and insist upon its intelligent application, is that the defeated party knows not why he loses, or the winner why he gains. The one may be content with the honor, and the other retire without complaining, but neither has been helped to an appreciation of what is necessary for improvement, by having the weak as well as strong features of their individual exhibits presented in detail. In fact, the committee awards too often encourage bad practices, by strengthening selfish admiration for one's own stock, and blinding as to its defects, and also discourage by failing to strengthen an appreciation of the good work already accomplished. There is, there can be, nothing educative under this system.

An agricultural society exists for three distinct purposes.

1st. To afford amusement and recreation.

2d. To stimulate production through competition.

3d. To educate, that agriculture may be advanced and mechanics promoted.

Competition, which is the prime factor in improvement, unless guarded and restricted, develops into a single thought of winning, regardless of justice or equity.

That competition may be made an educator, and thus a helper to better conditions, there is demanded the safeguard of the scale of points.

By awarding all prizes and examining all stock and products under the decimal or score-card system, every exhibitor may have

the evidence of merit, or cause of failure, to consider at leisure, in the detailed score-card. This may not insure any better judgment, but it furnishes *all the evidence* upon which judgment was based, and it is this, and this only, which will educate, which can advance and promote.

Every man who passes judgment on any article or animal, at any time or place, measures it by an ideal of his own. It may be imperfect, so vague as to be beyond description, yet to him it is a standard of perfection, and he approves or disapproves as the object approaches or falls away from that standard. You like a horse passing before you, but if I ask why, you cannot tell; yet in the glance you have measured by your standard, by your ideal. The one object gained through the decimal system of judging, above all others, is that it fixes this ideal of perfection by parts, so that one becomes critical in judgment; he becomes educated.

When a committee goes out to award the premiums by comparison, it is presumed that this standard of perfection shall not enter in to influence judgment, but that the examination and comparison of individuals shall determine the awards. The advantages here are, that the whole field may be examined together, and under the critical eye of the committee, the awards made and ribbons attached in much less time, than by the use of the score-card, on such animal; the objections--that the worth of each is measured by that of others, and the difficulty of carrying in mind the defects and their bearing upon values not appreciated, while the reasons for making awards, unless very obvious, drop out of mind as soon as the class is out of sight.

Against this I place the scale of points perfected for each class, the single judge, who shall affix his signature to every card, and the individual score-card for every animal of every breed, and for all products whether of the farm, field, orchard, dairy, shop, mill or home. Responsibility cannot be shifted here, and no man will put his name to a card unless reasonably sure of the record he has made.

This means simply that the article or animal or product shall be divided into parts, each to be measured by itself, and to each part a fixed value shall be given to represent the standard of perfection

as compared with the ideal, which is what one would have if that part could be made to suit their conception of perfection. Thus in the horse, 100 represents perfection in structural parts, each having a fractional value.

We give four points to the eyes. If these be large, full, lustrous, expressive, indicative of developed brain power, and increased brain capacity, telling of courage, and with lids free from meatiness, the credit would approach perfection. In seven years' experience, working with some of the best experts in the country, I have never known but one animal to be marked perfect in eyes. A critical examination always reveals something not desired. In case the eye is but ordinary the credit would be fifty per cent. of the whole.

If I send a horse to the stable with a credit of two for eyes, I have gone on record, and if any error has been made it can easily be corrected.

Suppose that two horses score the same in every other part, but simply because one has a meaty lid it falls one-half to one point below the other in total footing. Naturally the owner who loses raises the question, Why? And it is these why's which educate.

Bring the two horses together, compare them, point out the difference in expression resulting from the difference in thickness and flexibility of lids, because of that single faulty construction, and you will have set agents at work which will make that breeder more critical than would be possible in any other way; you have commenced the work of advancing and promoting.

In all operations two extremes are to be avoided, both are natural, depending upon the temperament of the breeders, growers, or manufacturers. One is to overlook defects and consider everything produced perfect, and the other to so magnify defects as to lose sight of real value. Both conditions are alike injurious to individuals and industries, both are promoted by the comparative system, both are remedied by the decimal.

Perfection in production has never been reached and never will be. The only incentive to labor lies in the hope of future accomplishments. If the maximum of growth, production, speed or quality had been attained, all incentive to improvement would disap-

pear. The scale of points brings out the defects in detail, and while educating to a just discrimination of values, indicates what is necessary to every grower, breeder or manufacturer—that is the weakest spots or parts.

One lot of apples fail in flavor, another in fibre, another in form, and it is only by placing a fixed value on each item in the scale of points and allowing the sum total to determine the award, that all the facts can be brought home to the individual orchardists.

The comparative system would not reveal the imperfections in flavor or fibre to the looker on, or to the exhibitors, unless all became tasters and tryers. One man finds his fruit cut in flavor and fibre, and at once the suggestion comes that pruning and cultivation and fertilization are necessary, that next year's crop may be improved.

How was it with the forty or more samples of butter at your last exhibition, all put up in attractive form, and passed upon by a discriminating committee, who placed the honors where they honestly belonged? Did you who won ever know why your product was preferred to others, or you who failed why you did not win?

Was it flavor or texture, color or method of salting and putting up, which determined? What possible benefit can it be to you, either as winners or losers, unless you know the reasons? What incentive to improve when only the ribbons tell the story of preference?

Every card giving the detailed score, returned to the individual exhibitor, becomes a promoter of better practices, and an incentive to improvement—an educator.

Suppose some tidy housewife returned without a ribbon or a card telling of honors won, but on the score card a decided cut in flavor, and at the foot a note, "decided barn flavor," a record possible in far too many cases. Think you she will rest until the cobwebs are swept from the tie-ups, floors made clean, cows groomed and bedding applied? The reflection on her skill caused by the slovenly practices at the barn will lead to decisive action and better outside conditions.

Show a man that the present mating of his mare is giving a heavy headed class of colts, and the thought of a change will im-

press itself immediately. You cannot demonstrate that under the comparative system, and the fact that the mare is from a producing family, and the stallion used from another, is too often accepted as proof positive of value in the offspring, regardless of individual merit.

Only by a study of parts, and a knowledge of the purpose of each, together with a high ideal of perfection, can the bad practices of present hobby-riding breeding be broken up. It has been this blind leading the blind which has filled our barns with stock of all kinds wanting individuality. The fact that so small a per cent. of our colts develop into valuable roadsters, that the average milk and butter production in New England falls far below the limit of profit, while there is a sure profit with both, furnishes all the evidence that a change is called for which will educate to a different standard.

The supreme excellence of the scale of points and score-card is realized only when every individual exhibitor is furnished with the detailed score of every animal, plate of apples, peck of vegetables, or manufactured product shown by him. Beyond this the educative work possible at all our annual exhibitions, great and small, can never be recognized or secured, until with the expert there goes the clerk, to place upon a black-board, where all may read, the record of each score as made by the judge. This publicity removes the last objection to the scale of points, and insures prompt questionings by interested parties.

As the work progresses and scores multiply on the black-board, the causes for variation will be inquired into, and the animals should be be brought together and the lesson fixed by comparison. The expert who cannot defend his score intelligently is not fit to perform the duties. Let discussions be encouraged. You cannot award honors to owners in such a field. There are scores present as sharp as the judge, and they will be satisfied only when the why's are answered and justice is done.

The furnishing of a copy of the score of each individual exhibit to each exhibitor involves extra work on the officers, but the exhibitors who make the exhibition have the right to insist that this be done.

If the State or the Board requires a standard of perfection, as it should, in order for an award to be made, it should guarantee the score-card to each exhibitor telling of the worth of his individual exhibit. Let the rule be established that a total of 75 out of 100 points must be obtained in order for a first premium to be awarded.

If agricultural societies are to continue and do their best work in developing the varied industries of a State, the best interests of the smallest and humblest exhibitor must be recognized. The tendency to concentration of exhibits and reduction in number of exhibitors must be prevented. No society has performed its task until every farmer within its limits is a regular contributor to the yearly exhibitions. Let every one be assured that the scale of points is to be applied to every exhibit, that each is to be measured by itself independently of all others, and that the score in every case is to be returned to the exhibitor, and the last barrier to a complete exhibition will disappear.

The objections raised against employing experts, or putting the work of awarding the honors in any class into the hands of a single individual, holds only in the imagination of the objector.

The task of judging by the scale of points is less arduous than by the old system. Having the card in hand, the judge attaches value to each part independently of all others, the total footing to determine the awards. Thus when one part has been passed, and the record made, it should drop out of mind.

One thought should here be emphasized. If the credit against any section is less than the full amount given for perfection, the reasons for making the cut should be indicated either by checking that part, or writing in the cause. Thus in the card for the horse, it reads: "Chest deep, full and prominent, good width," the standard being three points. If narrow, and the credit is one and one-half, the judge should underscore the words "good width," and then write in the word "narrow." Thus in every part care should be taken to make plain the causes for any reduction of credits.

I make this plea for systematic work in awarding premiums, and for extended and critical supervision by the State, through

the Board of Agriculture, for two reasons, either of which fully justify the claim.

First, because it is necessary in order to establish justice between exhibitors, and place awards in accordance with merit; and second, because of the imperative necessity for raising the standard of quality in all products.

The day has gone when we may expect increased prices for farm, garden, orchard or manufactured products. For years we have been approaching this lower range of values. Let no one fear that this or that industry has failed to be remunerative so long as the limit of production is beyond our comprehension and the saving in production an unknown quantity. Seeking earnestly, continuously, intelligently for the higher quality and lower cost, the margin of profit will always be assured.

Along this line and this alone, lies the path of progress for the farmers of New England.

Against the bulk of the West we must set the finish of the East; against the volume from the prairies must be placed the skill of the older sections; against the quantity pouring into our markets—the great consuming centres of the country—must be ranged the higher quality, which by keen study, close application and a just discrimination of the relation part bears to part, may be insured the growers and producers of the New England States. We cannot till a thousand acres at a net profit of $2.00 per acre, but we can till one hundred at a net profit of $20.00. We cannot produce a horse to weigh 1200 and sell for $80, as can the farmer of Iowa or Kansas, but we can produce a better animal with a higher range of intelligence, greater brain capacity and superior road qualities, which, undeveloped, will sell for $200 or more.

We cannot, perhaps, grow three-cent beef, but we can at the same cost grow 25-cent butter. The things we can do and the stock we can raise, the crops adapted to our time and climate, may all be made to give better returns and larger profits per acre, per pound or per bushel, than is possible outside our borders. Hemmed in under certain conditions as we are, it is only that the higher levels may be reached. The man who finds the path to

prosperity under any restricted condition, must do so by the use of greater brain power.

This means the growing of better animals and crops, and the making of better products, by the exercise of a higher skill. That this may be forthcoming, we must sit down and fix definitely in mind the worth of each part, and the relation it bears to every other part and to the whole. To do this with any approach to justice, measurements must be made by a scale of points, thus fixing values to every part.

In all farm products it is size, color, texture and flavor, whether in onions or apples, potatoes or pears.

Bring out the dairy cow, and her value is to be indicated not by comparison with a beefy neighbor, but by what she is herself. Not size, or form, color of skin, shape of body, length of back; not expression of face, or fullness and intelligence of eye; not size and form of udder; not one of these can settle the question, but each and all. Behind the whole is the individuality of the animal. Beecher said: "Men are like trees, each one must put forth the leaf that is created in him; education is only like good culture, it changes the size but not the sort."

Just so with the dairy cow, and to learn the "sort" that we may increase the quantity is the lesson of the hour. As we begin this study we find that beef in the cow, draft form in the horse, meat in the pig and hen are all allied, while over against them are speed, milk or butter, and eggs. This distinction grows upon one as the merits of the scale of points are appreciated. We learn to divide and sub-divide, to study functions as well as form, to measure tendencies and individual traits as bearing upon the one object, production; and the more clearly one is led to discriminate between a thief and a benefactor, the more rapid the growth of his steer, and the larger the returns from his dairy cow.

Take, for an example, the horse, the best friend a man ever had, because he never talks back. Without the scale we measure value as a whole, but under it the worth of what otherwise seems a minor part very often determines practical utility. Size, form, color, brain capacity as well as developed brain power, intelligence, docility, substance, endurance, both of which might be named

under the head of nerve force—quality of skin, bone, hair and hoof, these are what one learns to look for though only a small part are on the score card. These are to be the essentials of the horse of to-morrow, and when found will give value. It has been speed, and speed alone.

To-day the perfected horse is called for, perfected for the road, perfected for long continuous service. In the orchard and field, the home and the whole range of home manufactures, the scale, adapted to each class, becomes as valuable as among the stock, and its presence as helpful to the higher education of to-morrow.

The future of Vermont agriculture will depend upon the future of Vermont agricultural societies, and their life and perpetuity rest entirely upon their ability to assist the inhabitants to a clear and satisfactory solution of the great agricultural problem of the immediate future, one fraught with significance to every native born New Englander.

I have endeavored to show how this solution, which rests entirely upon the intelligence of the individual farmer and his co-laborers, requires that greater discrimination be used in determining the worth, the utility, the practicability, the possibility of each and every class and department of agricultural and mechanical products. It is not the financial success of this or any other society which is at stake, but the future of these farms; not the growth of the organizations, but the growth of that spirit of painstaking investigation which, rightly applied, will lead the young men of to-day to realize that here upon these farms, on these hillsides, up and down these valleys, with growing markets all about them, there are just as good opportunities for brain as well as muscle development, just as certain results financially, just as sure returns as town or city can insure, and in addition a more perfect manhood.

The farmer in New England who carves a future for himself in the next ten years will do it out of his brain, his hands being only willing servants. As a powerful aid and stimulant to the possible work and results, I place the perfected scale of points for each class and department, and urge its adoption by all agricultural societies, and its use by every indivdual.

Never has there been given us such an opportunity to enforce the lesson of the worth and dignity of agriculture as during the last few months, when labor disturbances have been destroying confidence and business is at a stand still. To-night all about us are thousands without work, without food, without proper fuel and home comforts, but they are not on the farm. Here there is "Bread enough and to spare." Carry this lesson to your homes, every one of you, and instil it into the minds of your children, that honest labor on any New England farm has always, and *will always* insure food, clothing and warmth to the family. No panic can destroy this confidence. It is *the* sheet anchor upon which we may all rely. Teach it to your boys and girls, and so increase their love for the home farm. Dignify the occupation by its further development through these educational steps indicated, and thus year by year add to the value, the productiveness, and the number of prosperous Vermont farms. Forget not to use the lessons of the present to inspire renewed confidence and zeal in the farm life of the future. It is in our hands to magnify the worth and dignity of the occupation, and doing this to swell the volume of comfort and happiness in every nook and corner of the State. For this reason we should read aright the lessons of the hour and teach the young their full significance. Doing this, blessing and honor, joy and prosperity will attend our labors, and coming years witness the desired advance in agricultural methods and consequent results. For this let us patiently, diligently, hope, pray and labor.

A horse was then led into the hall, and Dr. Twitchell proceeded to give an object lesson in scoring by the scale of points, describing as well as possible the ideal part as taken up. Said he: "While we all recognize a standard of perfection, it is not an easy matter to describe it so that another will see it in the same light. In fact, some parts cannot be described, yet they stand out clearly and distinctly in the mind of the individual. Let us then drop out of thought the horse as it stands before us, and think only of each part as taken up, comparing it with what we would have if we could mould it to suit our ideal of perfection.

The eyes come first, and these should be large, full, intelligent,

hazel in color, expressive, not showing the white, and with lids free from meatiness. You can hardly get an eye too full, so long as quality is maintained. You want an eye where you can look to the bottom of it, for there is no one part telling so much of the disposition or the brain power of the animal, as the eye. The ears should be of fair length, well set, neatly trimmed without being sharp; the face broad between the eyes, of good length, flat, straight, curving a little on top between the ears; the nose full, well rounded, with thin open nostrils; lips firm without being thick or thin, and jowl cleanly cut; neck shapely, well cut at throttle, of good substance, and so set at shoulders, both top and base, as to indicate good position without fear of dragging on the check; shoulders sloping, broad and thin at top, the point of withers extending well back to the saddle. In the shortening of the back, something called for to-day, the extra slope of the shoulders is called for to allow length under the belly.

The chest should be full, prominent and of good width; forearms long and heavily muscled; knees strong, neither calf-kneed nor sprung and not cut under too sharply at base; common bones short, broad from front to back, smooth and flinty in quality; pasterns long and springy, the angle being forty-five degrees from base of ankle joint to toe; feet of good quality with dark horn colored hoofs, free from contracted heels, of proper proportions and setting straight in line with the body.

The body should be deep at the girth, shaped like an egg, the point at the top short, closely ribbed and not light in the loins, coupling smooth and strong, extending well forward in line of the points of the hip and heavily muscled over the kidneys. We want the quarters of good length, not too sloping, well rounded and of fair width at base, the length between coupling and hip joint and hip to stifle such as to allow free, full action and extension. From stifle to hock the length should correspond with that from shoulder to knee as it is in these parts that the possible reach of the animal is secured; therefore they should be strongly muscled.

The hock should be of good size, strong, not cut sharply at base and neither straight nor having too sharp a curve, as both extremes invite disease.

In scoring, if any part is found unsound place a cipher against it and stop work. Give no premium to an unsound animal, but furnish the owner with all the evidence upon which the award was withheld.

Make the rule universal to give no award unless the animal or product possesses sufficient merit so that its reproduction *in quantity and like quality* is desired, and would be of profit.

Color in horses may be to some extent a matter of taste, yet it is safe to make the rich, soft, velvety bay the ideal, and measure others by it.

Substance in horse is to be seen in the ear, eye and nostril, form, thickness and manner of closing the lips, the hang of the head and neck, the manner in which the horse stands, quality of hair, bone and hoof. Determine the quality of action by seeing the horse led by the halter. Every movement should be in harmony and line with the motion of the body. For this reason avoid a horse which toes in or toes out, also one which straddles; the danger of accidents and loss of power is too great to admit any of these evils. In rapid motion the hind feet should fall just outside the line of the forward, and the entire movement from the instant the foot leaves the ground until it strikes it again should be in line with the line of the body. The force of this can hardly be recognized until one watches the horses of any town and notes the appliances necessary to balance and protect. For the road horse there should be no boots or weights. Nothing of the kind is called for; everything of this sort is a positive injury.

Different experts vary in their credits, but this forms no argument against the system. In any given exhibition all the exhibitor desires is that an equitable ratio of values be maintained. One may score high and another low, but if this be kept there is no cause for complaint. For one, I prefer the middle ground, 72 to 82. The objection to the high score, 95 to 99, is that one is led to feel that perfection has been reached, while an extremely low score would discourage. Personally I lean to the middle ground, whether on structural parts or on pedigree.

While recognizing the value of the latter the worth of individuality must not be overlooked, and right here is the greatest claim

for the score card, that it teaches the worth of parts. I do not believe in what is termed expert work—that is sending away for some stranger to make your awards. *This is wholly wrong.* You have all these years been trusting to the decisions of your neighbors and friends as committeemen, without asking any evidence for their awards. Why not trust the score card to them, when it is to come to you with their record upon it? I would urge this practice work by your agricultural societies and granges, and so develop the talent you have in every society and secure your experts at home. It is just this educative work which is called for to advance and promote the agriculture of New England.

Nothing will so rapidly tend to critical judgment of parts, or provoke interest in your agricultural societies, as an exercise like this, where the largest number possible take up the work of scoring, and then compare notes and criticise each other's work.

### SOUTH RANDOLPH INSTITUTE.

Mr. H. P. Riford—It would have been an easy task a year ago compared with to-day, to write a paper or open a discussion on the subject of horses. Like all other products that contribute to the comfort, necessity and pleasure of man, the horse is subject to the fluctuations of the market, but never in the history of the United States and perhaps the world was the horse market in such a condition. No sale for an ordinary horse at any price, colts sold at auction at hardly first cost, nothing but a first-class gentleman driver that has speed, style and sire will sell; such are comparatively cheap. Why, we are hardly as well off as the man who said he always bought and never sold. When asked how he got rid of the surplus he said he swapped two for one. We can't do that for we all want to trade one way. Two reasons aside from hard times have brought about this condition of things. The substitution of electricity for horses has thrown upon the market thousands of cheap horses, some of them not worth the transportation from city to country, but still finding a customer because they can be bought for a song, thus depressing the price of our common stock. When this stuff dies off as it will in a few years, our ordinary horses will again bring a fair price, unless the free trade craze assumes a

violent form and foreign countries pour in upon us a plague of horses. Another cause that effects more particularly the raising of fine, speedy, gentlemen's drivers and carriage horses, is the fact that hundreds of rich men all over the United States and other parts of the world have established horse breeding farms for recreation, and ambition to produce a world-beater,—the profits are a secondary consideration,—stocked them with the best trotting blood that money can buy, paying thousands of dollars for brood mares and tens of thousands for stallions, $105,000 for an Axtell, $125,000 for an Arion, $10,000 for a Ben Franklin to go to Tennessee, where, by the way, they have some very fine and fast colts. They appreciate a good Morgan horse down there, and Vermont kept up her reputation for folly when we allowed one of our best stock horses to leave the State. Now they succeed in getting out of a hundred foals about one trotter that goes fast enough to amount to anything; the rest must be sold for what they will bring at private sales or at auction. As they are mostly fine animals, many with speed, they have sold for good prices, often up in the thousands, and men that were looking for a future trotter were ready to pay almost any price, but now the overproduction on these numerous farms and the hard times has affected them.

Watching the auction sales you will see very low prices quoted. The result of all this has been to almost destroy the legitimate business of horse raising by farmers unable to compete with them in raising the trotter. They must turn their attention to some other breed, so they try the Percheron, wholly unadapted to the East; the Cleveland Bay, narrow chested and with too little spirit and nerve force; the lumbering Clydesdales; last and least the Hackney. Some might feel slighted with the bare mention of their name. I will pay my respects to them later. But while we are searching for the horse of the future, we forget that right here in our midst, among the Green Mountains, are the grandest horses the world ever saw, the descendants of Justin Morgan. If you want a pair of horses that draw a load, pick out the get of that grand horse Aristos. You can find plenty of horses weighing 1,200 pounds and measuring 16 hands that can draw a load or trot a fast mile. There might have been more of them if fine, large car-

riage and draft horses had been in view, but there has been too much breeding of trotters at the expense of size and style. Many of the get of the great Lambertus, full brother to Aristos, that Joseph Battell procured to take the place of Daniel Lambert are fine animals with size, style and spirit. What a pair they were; hitched together, able to trot their mile in 2:20, yet gentle as lambs. Judiciously used they might have been the foundation of a class of all-purpose horses. Look at the great strapping sons of Ben Franklin, another son of Daniel Lambert, scattered all over the country. Don't you suppose they could draw loads as well as trot? Use them if you please to build up the horse, or, if you want a somewhat smaller horse for light draft with fine road qualities, there are plenty of the smaller sons of Daniel Lambert to breed from, handsome, intelligent and speedy. Other branches of the Ethan Allen family are worthy our attention. Mr. Battell has Denning Allen, well worthy of all the praise and prizes he has won. He is one of the finest horses I ever saw, worthy to be the founder of a great family of horses, as we hope he will be. If you want a blocky, nervy horse that can endure to the end, the descendants of Woodbury Morgan are still to be found; they possess that peculiar qualification necessary for the parade horse. We don't see very much of them now, that proud lofty step always ready to dance and prance at the sound of martial music; nothing would stir the blood of a Vermonter like the sight on parade of a Morgan horse of which old Green Mountain Morgan was a true type. They were plenty in the days when we middle aged men were boys. It reminds me of the little fellow who was invited by a playmate to go into the house to see a late arrival into the family. After looking at the small specimen of humanity he turned rather contemptuously to his playmate and said, "Oh, I've seen 'em, we've got one." Of all the follies that we have been guilty of, that of letting this splendid class of horses slip from our grasp is the greatest. What greater pleasure to a farmer was there than to hitch a pair of those horses to a plow, mettlesome, impatient to start, yet obedient to the slightest wish of their master, starting on a prance, sideways, almost on their hind feet, yet never out of the traces. If you wanted to leave them they would stand like statues till your

return. When the day's work was done were ready to dance all the way to the barn. Many of you will never forget them. Those same horses could go on to the road or under the saddle and do wonders. They were the grandest horses the sun ever shown upon, and to Vermont came men from all over the globe to buy the peerless Morgan horse, peerless in all that goes to make the *perfect* horse. Intelligence, beauty, speed and endurance were theirs. I have not time to speak of the other breeds of trotting blood. Their history is made and it is a grand one. They have been improved until they have extreme speed, size and good looks. We have a Mambrino King that is famous as a sire of horses with speed and beauty. Many of the Hambletonians are very handsome and good roadsters, leading the world in speed to-day, but none of them possess that peculiar indescribable grace and beauty of the Morgan horse. We had no need of going to that source to improve our Vermont horses.

Now give a moment to that latest of rich mens' fads, the Hackney. You have seen the old style Morgan horse placed beside the short necked, docked tailed hackney, a first-class representative of that high stepping, all-purpose horse of the future, as some talk it. Lead him out beside Ethan Allen, Daniel Lambert, old Gifford Morgan, or a hundred others we could mention. How do they compare? Gentlemen, is their step any higher or carriage more lofty? Place an ideal Hackney beside the peerless Ben Franklin, the grand old Aristos, the beautiful Thought. What think you of the comparison? How would a Hackney look going around the track after old Highland Gray? "Like a hog on ice." But comparisons are odious. Let us throw the mantle of charity over those that have bred the Hackney. We are all of us too apt to try some new idea before it has proved to be of any value. Let those that can afford it throw away money experimenting. Let me say to those who have a good brood mare: Use the best Morgan horse within your reach, one with size, style and speed, for while speed should not be the main object in view, I would not breed to a horse without good signs of speed. Now, it's a long lane without a turn, and the tide may turn sooner than we expect. Horses we shall and must have. More discretion will be used in breeding in the future,

and that Yankee grit, of which the British said in the war of the Revolution "They never know when they are whipped," will see us through this blight of one of our greatest industries, and we can again command the market of the world.

I will not refer to the care, etc., of colts, for it is too well understood that we cannot turn them on the north side of the barn to winter and expect it will pay. If you cannot take care of a colt do not raise one.

I thank you for your patient attention and hope I have not overwearied you.

# MAPLE SUGAR.

## EAST BETHEL INSTITUTE.

A. P. Paine—As far as I am concerned I have always made maple sugar. I was brought up on a farm where it was always made, and looking back over the time I can see that we have made great advances in the processes of making and in the quality. We usually have tapped four hundred trees and the sugar that we make now is considered superior. We have no particular trouble in selling at a fair price, and I have worked up a market among a certain class of consumers who seem to appreciate good sugar. I think the remark of Mr. Spear that good sugar will be appreciated, to be well put. As it now is, the people in the city think they know maple sugar when they don't, and some, too, prefer a poor article to a good one. I understand that Mr. Whitman in using sugar at the Fair preferred a medium quality and what I called a poor quality. I have been told that he thought it was bought right for the custom. I know that some of my sugar, not any poorer than others make, has been refused because it was thought that it must have been adulterated with white sugar. I think if we will try to make all we can of good sugar we shall have no trouble in getting a market for it. Maple sugar is a product of only a small section of the country. Northern New York, Ohio, Vermont, New Hampshire and Maine produce about all, and Vermont makes the most according to its population, so that we have a kind of monopoly of maple sugar. I think we shall be to blame if we don't take advantage of it. I think there is no end to the market we can have if we take pains. This Association started at Burlington will, I have no doubt, be a good thing, and I think the Maple Sugar Exchange has done a great deal to extend the market where the people have known of its methods. As to those methods, everyone here knows as well as I, and I could not say anything that

would be of any advantage to a maple sugar maker. But one thing as to coloring; rapid boiling is apt to burn it a little. When we have a hot fire, and keep it boiling as fast as possible, it burns a little without our knowing it, and my idea is that slow evaporation is better than rapid. Most people believe rapid boiling necessary, and while there is no doubt that it is necessary to convert it into the product as quickly as possible, that is, not to allow it to stand and get sour, still, I would not have the boiling process too fast. If we could evaporate without having the fire come into direct contact with the pan it would be a good thing. I have heard something about evaporating by steam, but I have never seen it. I got a large sugaring-off pan and had a Bellows Falls evaporator. Before I used that pan I put some sap in it and also into the evaporator, letting it stay there twenty-four hours. This sap evaporated slowly and in twenty-four hours had changed to syrup. The quality was not very good, but the color was as nearly perfect as anything I ever saw. There was no burning or anything of the kind. I think that if some one will invent a process of evaporating without having the fire come in direct contact with the pan, we shall be able to make a clearer, nicer syrup.

Mr. Spear—I would say that it is entirely possible to evaporate by steam at the present time. The only question is whether we can afford it. It requires a boiler, and if one had several thousaud trees it would be profitable to use this method. Mr. Whitman at Chicago did his evaporating by steam. Too rapid boiling does injure the color and flavor of maple sugar. We have all tried to see how fast we could make our sap into maple sugar, and our best sugar makers are seeing that the fast boiling is injuring the quality of the product. It has always been impossible with the evaporator to get as light colored syrup as when we take the sap into the house. What we get by this process is nearly always lighter colored and of a better quality than what we get by the evaporator. The steam evaporator of course will overcome this, but just now we cannot afford to put in steam for the small number of trees we have.

Mr. Jones—I would like to ask whether the use of the co-opera-

tive system has been tried, as it has been in the creameries. Would it be practicable ?

Mr. Spear—I do not think it would be practicable. It has been urged against co-operation that there is too large an amount of sap to be drawn. If there could be a central place for drawing and make it for two or three thousand trees it might be done, but I don't think it would be practicable.

Mr. Mead—What is the idea of having some seal or stamp of the Sugar Makers' Association as a guarantee of purity ?

Mr. Spear—They have had this under consideration for over a year, and we have a label for use by all members of the Association. We find that we have better rates under this label than we could have by a copy-right. The use of a label of this kind is said to carry with it a right to ownership and can be protected by law. With the label that is now used by the Association we are permitted by the laws of any State to prosecute a person infringing on our rights. This is of the utmost importance to the consumer, for by the use of a label of this kind they are sure of the purity of the product.

J. G. Fowler—Do farmers adulterate maple sugar with white sugar ?

Mr. Spear—This question has been looked into for many years. While I would not say that some persons have not done this I am confident that the product is limited to here and there a few persons, if it be done at all. There is not a demand for any one to adulterate sugar in Vermont ; besides we have a very stringent State law in regard to adulteration. I don't think it is practiced to any great extent.

Mr. Gabrilson—Where is the chief market for your maple sugar ?

Mr. Spear—It would be hard to say. It goes to every State and city, principally to Boston, and very largely to the West.

## IRASBURGH INSTITUTE.

J. S. Dodge—The manufacture of Maple Sugar is perhaps a matter of small importance to discuss at a gathering of this magnitude. Nevertheless, it is a subject of much interest to a large majority

of the farmers, and many that are not properly farmers, of this county and State. It is a business that has increased greatly within my remembrance, as much so as almost any other, both in quantity and quality of product.

Looking back 40 years we see as great a change in the producing of Maple Sugar as in the improvements in butter making, and there is a great opportunity for improvement; still, in fact, the time seldom comes when there is no room or opportunity to do better work.

The question arises in our minds why there is so much poor, black and low priced sugar made. As I see it, it is lack of care in having everything clean and nice, and of having the work of changing from sap as it runs from the tree to sugar, in the most expeditious manner.

In the first place we must have the best utensils of all kinds, good spouts and tin or well painted cedar buckets; I prefer tin, and what I should consider as perfect an outfit as could be found would be tin or galvanized iron for all utensils; buckets, pails, holders and boiling apparatus.

Then every thing should be scrupulously clean; not clean as a certain mother advised her daughter as the story goes, and I suppose it was true. In olden times a lady of note had a number of friends visiting her; she sent her daughter to wash the spider; after she had been out some time, she came rushing in, "Say, mother, shall I wash it clean? The reply was "Yes, middling."

Now one great mistake is, the utensils are kept middling clean. To sum up the whole matter in as few words as possible:—

All utensils should be perfectly clean to start with, and kept so every day. Gather the sap as soon as there is enough to start the pans or evaporator, boil as fast as possible, running the sap as low as you can with safety. Boil into sugar as soon as you have syrup, put into packages to suit customers, remembering that a clean, neat package, will sell better than a dirty, rough one, and that it costs but little more to make *ten cent than it does five or six cent sugar.*

No 1 sugar will always sell at a good price, as the call for such increases every year.

I hear some say, where is your market? I answer, all over the country.

Nearly every one has a friend or acquaintance in the cities, or in the West, who will want a case or two, and soon their neighbors will know it and will want a little, and if it is No. 1, orders will increase without much exertion on your part. But if you have no friends, make some by sending out a few 5lb. or 10lb. cans to those who know what a good thing is, and are willing to pay for it.

# MAKING AND MARKETING MAPLE SUGAR.

## MARSHFIELD INSTITUTE.

A. M. Foster—There were giants in those days, but they have all left us. Comé, let us reason together. This is, I suppose, an experience meeting, and I suppose we have the privilege of swapping information with you, as you say in swapping horses. In speaking on this subject I am reminded of an experience I had with a party in Nashua who sold maple sugar for me. I sent him some sugar one spring, and from force of habit I said in my letter that we were expecting a short crop, for we always expect that, and I hoped he would get me a good price. He wrote back. "There is a good crop of maple sugar as you will see by the following extract from a paper: "There is so much maple sugar in Vermont this spring that the girls are twice as sweet as usual." I want to talk this matter over with you in a very free way, and let us imagine that we are setting out on a regular talk: let us imagine that it is a new industry. How shall we go to work at it? Now, we should try to get at the bottom of it, and do it in a sensible way. Some of you know that I am a sort of monomaniac on the subject; and the first recollection of sugar making that I have is going to the house for a chunk of salt pork to put into the kettle. I have worked for myself or somebody else for the past fifty years in this sugar making business, and I don't make sugar for the fun of it; I don't believe any of you make sugar for health. I got a new boiler for the old one; I presume that you don't all follow the old ways. I don't know of any good sugar place that is unoccupied, and I conclude that you get something out of it. The question is, can you get a little more out of it. I don't think we are getting as much out of it as we could. Let us suppose that there is a dairyman here who is making butter at 18 cents a pound the year around, and if he could by seeking better paying markets and taking better care of his cows get 30 cents a pound for his butter, would he not do it? Well,

that is the case with the maple sugar business. We are losing four cents a pound. I want to read a few figures and then make a few estimates. There are three sorts of people that come to these meetings. There is one sort that takes every thing for granted, another that doesn't believe in new ideas, and another that sifts out and makes use of what is suited to them.

We made 117,000 lbs. of sugar last year; a little is made in Cabot, a very little in Woodbury, and some in Marshfield. We made at our place 150 gallons of syrup. Some say that one-third of all the sugar made in the State is made in this little district. I have estimated it at 134,000 pounds. I want better markets, better handling, to add four cents a pound to present prices. Now that would be very little. It is a business with me, and that is one cause for my knowing any thing about maple sugar. I have spent forty-three years working for myself, and I have been a great while learning a little. Sugar making comes just once a year and one month in the year. There is another thing about maple sugar making that is not like any other business—it cannot be co-operative. It will not be long before the churn will be in the garret with the loom, but this business cannot be co-operative. If it was, there would be needed one of the most expert chemists, an expert fireman, and a man to sugar off. It cannot be co-operative.

Then what can we do? We must adopt as many of the conditions as we can to the individual man. If any of us succeed in farming we must study hard to produce the most at the least cost. That is where our profits come in, and it will be the same in sugar making. I wish to say that I shall have to talk a little about myself, as I know most about what I have done myself. When I commenced sugar making I found I had 850 sap tubs, some split out and some just right to build fire with. The holders were left inside and out; nothing was in good shape for sap. The large gathering tub stood under the eaves in summer, and the low one was just right to scald hogs in. The pans were useful to set outside to put ashes in—and this was the rigging we had to use. The evaporator came around, but I was prejudiced against galvanized iron, and I struggled along about twenty years in this way—I made some

failures of course, but all the time I was learning. In 1878 I built a barn, and I also frightened our folks by building a sugar house 40 feet long. I built a plant that cost me $1000 and I have been adding to it since. I have a copper evaporator 14 feet long that I have used fifteen years. In the labor and extra expense saved they have been worth a half cent a pound to me for what sugar I have made. I have made two tons a year on the average, and they have paid for themselves, and given me at least $250. I suppose these gentlemen all know what a pound of sugar cost them. Perhaps they would say that it costs them six cents; then you don't get very much profit. Now I have figured some on that, and I am now saving twenty cords of wood, besides $50.00 in labor, by using arches. That would be one-half cent a pound and I credit $100.00 for the wear and tear. I have gotten one-half of it back in the saving of wood. Now these 5,500 pounds that I made last spring net a fraction less than ten cents—the sum that I got was a little over $600, including syrup. Calling it all sugar, the whole product with the bounty gave me 11½ cents net. Now the four and a half or three and a half cents at the least calculation that is usually wasted I saved—and that four and a half cents was clear profit to me. You can see that this amounts to quite a sum, where one makes a large amount of sugar. At 4½ cents I saved on 5,500 pounds just $247.50. Is not that worth saving? I have never been able to see why I could not get just as much out of a dollar that was made from sugar as one that came from butter. We keep a dairy, and raise some potatoes; while in the making of sugar one-third is profit, in the rest of our farm operations only one-sixth is profit. That is, we have to sell $1,200 worth to get $200—and the sugar is made in one month, while the cows have to be milked ten months out of the twelve. They have to be taken care of all winter and there is a great deal of work in it. There is some work in rigging up for this, but the argument I have to offer for it is—it pays. I like to make sugar, but I don't like to make sugar well enough to do it unless it pays. We have some good sugar makers in Vermont. There is a sugar meeting in Burlington next week, and they propose to get up a way in which to reach Western customers, and pro-

tect the sugar makers of Vermont against frauds. They charge a fee of only a dollar for membership.

Now I wish to refer to the Ohio exhibit at the World's Fair. They had a fine exhibit. We beat them so far as awards were concerned, for we had awards for all the samples sent there, but we only had about a third as many as Ohio. They have had a Sugar Makers' Association in Ohio for a good many years, while ours is but a year old.

Some sugar makers would want me to help sell their sugar, but if I am going to help them sell I want to help make it. I don't want to do the business and have them do the work. The last day the sap is gathered I help gather in the tubs, set them beside the sugar house right side up, where they won't fall down. Take a force pipe and put water in them all, and let it stand there two or three days, then take a little brush and wipe around the inside, and then wash thoroughly in warm water just as you would wash dishes. The tubs should be bound of course. Rinse them and turn bottom side up to dry, and when dry pack them away in a clean dry place, where no dust or leaves can get in. We hear a great deal about bacteria, spores, germs, etc., and it is just so with anything sap has touched—there will be a taint left if not thoroughly clean. I think I am giving you good advice; it is just what I do, and I know if there is any sap left in the tubs I have trouble the next year. The trouble might be in wooden spouts—which however I don't use; if I used them I should be uncertain how they would be next year. *I* should make a fire with them. Sap gets into lots of trouble by being in bad company.

Our scientists tell us that the first run is the best. Now can you imagine what these men are thinking of. The first sap is almost always poorer—I asked Prof. Cooke what was the matter with the second and third runs, and he said there was a change going on in the tree. You will remember that we had a good run last year, and a better one later after Prof. Hills had been up for samples. They came up one week and expected to get the best product.

I use iron spouts with a hole in. I put four pounds of cooking soda into 2000 of them and let them stand. Before they are used

something must be run through—a feather will do nicely. We used to think sap was not sour if it did not thicken. The sap begins to change as soon as it leaves the tree, and needs to be boiled up as soon as possible. People are satisfied that they must boil up as fast as possible, and are getting boiling apparatus with which they can do it the most economically and yet rapidly. The coming sugar maker is going to do all these things, take care of his sap tubs and spouts, and have better boiling apparatus. Two of the best exhibits I saw at Chicago were from Morrisville and Manchester. I wrote to both the men who sent the exhibit, and the Manchester man wrote me he made it in an evaporator that he bought in 1860. He said he had burned it several times but he was going to use it again this year. I suppose he took me for an agent for evaporators, for he gave me little information as to how it was made. I knew how his syrup was made. He must have gathered the sap every day and boiled it every day. He gets good prices for his sugar. At the Sugar Makers' Association at Morrisville I met several sugar makers, and more at Burlington who got twenty cents a pound and some who got fifteen cents for their sugar. For their syrup they got a dollar a gallon, which is equal to twelve and a half cents for sugar. I got the bounty and eleven and a half cents for the whole. If I were going to put in two or three hours I could tell you what was necessary to do to make the best sugar. Entire and absolute cleanliness is necessary—the one thing you cannot disregard. If I were going to have a motto I should say, intelligent enterprise is necessary. Skimming constantly is necessary. Do the syrup down to eleven pounds a gallon for convenience. Take all that is wanted for maple syrup or honey, and sugar it off. I think syrup will settle better in a tin sap bucket, and in a cool place than if left standing in a warm place. As to sugaring off, I think this bounty has been a good thing in one respect. We have sent off too much water in the sugar. The people didn't kick perhaps when it was sent to them, but they kept it all summer and it moulded, consequently they never wanted any more of that stuff.

Prof. Cooke sent Prof. Hills up to my place to get some samples a year ago, as I have indicated. The roads were very bad and of course he had to eat dinner in the time, and he had a little over an

hour to put on his sugar and sugar it off. And it may be interesting to some to give the figures on three qualities of sugar which he designates as good, medium, and poor quality. In putting into the jars he had to cool it a little, and had to put it in with a spoon, and of course it could not test as high as it otherwise would.

GOOD QUALITY SUGAR.

| | | | |
|---|---|---|---|
| 219 | degrees | 66 | per cent. |
| 221 | " | 69 | " " |
| 225 | " | 75 | " " |
| 230 | " | 81 | " " |
| 235 | " | 84 | " " |
| 238 | " | 85 | " " |
| 242 | " | 88 | " " |

MEDIUM QUALITY SUGAR.

| | | | |
|---|---|---|---|
| 219 | degrees | 62 | per cent. |
| 221 | " | 64 | " " |
| 225 | " | 69 | " " |
| 230 | " | 75 | " " |
| 233 | " | 78 | " " |
| 235 | " | 82 | " " |
| 238 | " | 83 | " " |
| 242 | " | 86 | " " |

POOR QUALITY SUGAR.

| | | | |
|---|---|---|---|
| 219 | degrees | 58 | per cent. |
| 221 | " | 59 | " " |
| 225 | " | 64 | " " |
| 230 | " | 67 | " " |
| 233 | " | 70 | " " |
| 235 | " | 72 | " " |
| 238 | " | 74 | " " |
| 242 | " | 76 | " " |

The good and the poor quality sugars were stirred, the medium quality was unstirred. The medium 235 degrees and over would have drawn the premium. There is one lost sample in the lot of which we received no report—I don't know the cause. This is the

result of test by the polariscope. I want to say one thing. Prof. Hills brought his own thermometer with him—a Bellows Falls thermometer—that pleased me because it gave me a chance to test mine by his. When you hear a man talking about the polariscope test it might mean one thing, and another by the thermometer, and you really don't know whether you are getting the right per cent. or not. I sugar off more rapidly than I used to. When it boils too fast I take some fire out, and sometimes if it gets too low I put in some more fire while sugaring. You want a fire according to the sugar. I sugar off rapidly but I don't want to feel in a hurry. Don't delay it, or let it stand around. I want to see grains of sugar on the bottom of the sugaring off pails. I run a wooden paddle through it, and if by any accident it stands too long and gets cold so that when it is dipped out it breaks off, it will not be so good. If it will pour it will be all right. I presume some one will ask what makes a tub of sugar break in a little. I am glad to answer them, so far as I know. Under some conditions I might say it was too warm when put in the tub, and under others it might be because it was too cold. I suppose the real reason is that there is some steam in there that when the sugar crusts over comes out and lets it down. Now this is about all I can tell you of making sugar.

Of course everyone knows that the wooden package is better than the tin one if kept over summer. I should never use tin for myself, and yet some of my best customers order it in tin. I am told that the best package is a bass-wood tub well seasoned and with good hoops. I use packages of this kind. They absorb a little more of the sugar, and it gives them a little better appearance. I would buy these for myself from what I know of them, as I want the best. I take a little pains when I handle the tubs before the sugar is put in. I never wet a sugar tub, inside or out. I look a man all over when I ask him to take the tubs to the sugar house. I don't want a man at the depot to know by the looks of the tub whether it is butter or sugar. I don't want any sugar on the outside of the tub. It should be filled pretty nearly full, and should stand as near level as possible. There are a hundred little things one must know and look after in making maple sugar. Now if Mr. Spear would tell us how to

market the sugar I should be glad to sit down. I don't know as I can tell you how to market maple sugar. The first thing I do is to make it just as good as I know how. Make it good every time, and if I have an order for a certain quality of sugar, I do not fill it with anything else. Have a standard and keep right up to it—that is the way to keep customers. How to get them is another thing. I tell you what I would do. I would advertise. I would see how a bright business man did his business and that would be a good motto to go by. Send out samples. Send out printed matter and tell people what you mean to do. It will return after many days; it always has with me. I send out 50 or 60 circulars before sugaring, and I always hear from them. There ought to be some here who send to the Western trade, and this Sugar Makers' Association should ask the railroad to give them the same privileges that they do anything else. The sugar makers of Vermont should have three or four sugar days in Vermont in the Spring. It would mean a great many dollars to me. A car-load of butter would go from Newport to Minneapolis in seventy-two hours, and our sugar should have the same attention. It should go in three or four days and now it takes several weeks. How much the trade would be enlarged if we were combined, and asked for some special privileges as sugar makers. In the State of New York, once upon a time, there was a black-smith who made everthing that a black-smith makes. There were some carpenters that went to that town to work on a church, and one of these carpenters went to this black-smith and said: "Make me the best hammer you can make," and the black-smith said: "Perhaps you would not want to pay me for such a hammer," but the carpenter said he wanted only the best. He took his hammer, and then the other carpenters wanted them until there became a great demand for these hammers. By and by a man came into his shop and asked him to make a pretty good hammer, and he said: "I don't make a pretty good hammer, I make a *good* hammer." This man succeeded.

We must climb up step by step. There is a great deal of harm done by lavish giving. The boys that hoe their own rows are the boys that make the best men. Now let us not jostle each other but climb up, each for himself. There is plenty of room at the

top. We want good farmers, good dairymen, good sugar makers, but most of all *good* men.

Mr. Carleton—I would like to say in addition to the remarks of Bro. Foster, that I have brought over one of my sap buckets to show you. I bought 60 of these buckets twenty years ago last March. They are all a good quality of tin, and are in as good condition as when bought. The way I have handled them it takes one day to prepare them for use and a day and a half to put them away. On a dry day I pile them together and put them in the wood-house chamber where it is dry. When spring comes I take them down, wash them clean, scalding them out and letting them drain. Then I take them on my hand-sled and draw them to the woods. I never have any sour sap as we used to have in wooden buckets. These buckets are large, for I had them made for Sunday buckets. I never gather sap on Sunday.

Mr. Pike—Does Mr. Foster do anything to his in the Spring when he takes them out?

Mr. Foster—If there is any dust in them I brush it out, but I never wet them when I take them out.

Mr. Pike—Don't they leak?

Mr. Foster—No.

Mr. Pike—Do you use tin or wooden buckets?

Mr. Foster—I have part tin and part wooden buckets. They stand in the same conditions.

Mr. Pike—Do I understand you to say that you use covers?

Mr. Foster—I use something I make myself, of bass-wood. There is a little bolt that screws into the tree so that it doesn't come off until the spouts are gathered. I got up the spouts myself.

Mr. Pike—Does your cover shut down tight enough to keep out the millers, leaves, etc?

Mr. Foster—No, I don't know as that is to be desired. I never used a cover that would.

## WESTFORD INSTITUTE.

L. R. Tabor—It is with a sense of inability that I come before you with this paper, to read the few disjointed remarks on maple sugar, prepared for this occasion. Referring to the history of this

industry, we find that the manufacture of maple sugar, like the raising of corn and tobacco, was practiced by the Indians before the settlement of this country by the "Pale faced people." But their method of manufacturing sugar, and the quality of their product, differed in a marked degree from those of the sugar maker of to-day—and much more so than the corn and tobacco field and the product therefrom.

The manner of tapping the trees, and the spout and the trough for collecting the sap, were not much dissimilar to those used by the early settlers, but the tools used by the Indians in making their troughs, etc., were of stone, instead of iron or steel. Their evaporators were the most primitive, consisting of a log hollowed out something like their dugout canoes.

After the sap was gathered and poured into this original evaporator, stones were heated and thrown into it until the sap was of the desired sweetness. Strange as it may seem, this process of boiling sap had some advantages over the present method. The Indian sugarmaker had no fear that his regulator would go back on him and shut off the inflow of sap, or get caught in some way so it would not shut off when the fire went out. His evaporator would neither burn up nor run over, nor did he burn his tongue filling the syphons which connected the different parts of his evaporator, or worry for fear one of them might fail him when he left it.

But the product of this Indian sugarmaker. Bah! Good enough for Indian, but would not suit our folks. When our ancestors found that sugar could be made from the sap of the maple, they procured kettles which would hold about five pails, (we occasionally see one of those old reminders of early days) which they would string on a pole, two to six in a line, and then roll a big log close up to each side for an arch. The wood was fed into this arch on both sides, and stuck in endwise between the kettles. Their sap buckets were not buckets at all, but rather troughs, which were made by cutting a basswood or ash log of a foot or fourteen inches in diameter into about twenty-four inch lengths; then, splitting them in halves, they dug them out with an axe and howel.

Thompson, in his Vermont Gazetteer, states that one man made fifty of those troughs in one day.

When a tree was tapped it was done with an axe, by cutting an oblique notch, or box as it was called, about an inch deep, and three or four inches long. At the lower end of this box, a gouge was driven into the bark, deep enough to hold a spout, whose sharpened end was made to conform to the gash made by the gouge.

The gathering pails were shaped like the tin ones we have now, but were made of pine, with two staves on opposite sides, some two or three inches longer than the rest, and had holes for pins, which passed through the wood bail and then through these holes, and was prevented from coming out by leather keys. These were the days of the sap yoke, when all the sap was brought to the "boiling place" by hand, or rather on the shoulders of the sugar maker.

Usually the wood was cut only as needed, and one man was expected to cut the wood, and gather the sap and boil it, from 200 or 250 trees.

When sugaring was over for the season the troughs, without washing, were turned on end against the trees until wanted for the next sugar season, when they were dug out of the snow, and "set" for another season's run. I have been informed that sap troughs are still used by one sugar maker, living near "Snake Hill" in the town of Milton. Making maple sweets in those early days when the snow was from two to four feet deep on a level was hard work and small pay, as compared with present methods. One instance of the hardships endured by the early settlers, to make the family supply of sugar, is told in Thompson's Gazetteer. In the spring of 1777, previous to the settlement of the town of Corinth, Ezekiel Colby, John Nutting and John Armand spent several weeks there making maple sugar. They started together from Newbury, each with a five pail kettle on his head, and with this load traveled by a pocket compass twelve miles through the wilderness to the place of destination near the center of the township, where they made maple sugar that spring. Troughs and spouts were made on the spot.

After a time, the unwieldy potash kettle, made of cast iron nearly an inch thick, bought in and imported from Montreal, was brought into use for boiling sap. Then followed the cauldron kettle, and large bottomed buckets, which took the place of the five-pail

potash kettles and sap troughs. To prevent the sap from boiling over, a hunk of pork was suspended just above the sap, so that when it commenced to foam up it would take in some of the grease and flavor of the pork, which, with the sugar which would burn on near the top of the kettle when the sap boiled down,—to be soaked off when more was added, and the numerous cinders which fell into the sap with a fizz, together with the ashes drawn up by the draft around the kettle and eddying over into the seething foam—gave the peculiar *maple* flavor to the syrup and sugar of those early days of our middle aged citizens. But we must admit that the sugar in those days did taste good, especially when waxed on snow, and the visits to the old family sugar tub, which held 200 or 300 pounds of sugar were of frequent, yes, I might say almost daily occurrence throughout the year.

A few years of that style and then came the Russia iron pan and close stove or brick arch, and the sugar house. About this time, or perhaps a little earlier, tapping with an axe and gouge gave way to the $\frac{3}{4}$-inch auger and bit, and the sumac, and sheet iron, and tin spout, with a spike to hang the large topped unpainted wood bucket on, began to take the place of the big bottomed bucket. These spikes were made by our blacksmiths, and were driven into the tree 4 to 6 inches below the spout. This ended the setting of buckets on the snow, and saved much time, sap and patience. But the spikes were hard on the tree, and are now hard on the chopper's axe, and patience, too, when he strikes one which was overlooked and left to grow into the tree.

Quite nice sugar was made in those days by the sugar makers who kept their utensils strictly clean, and syruped off often.

Next came the evaporator, (first with wood and then with iron sides) which Mr. Timothy Wheeler, whose article on Sugar and Sap lore that appeared in the N. E. Homestead of Feb. 22d calls "a long step in advance," using which, with all the other improved utensils and methods, we are able to make a light, amber colored, delicious maple flavored syrup, (some call it honey,) and sugar, which is bound to sell at good paying prices. Among the latest and best improvements, and one which we are slow in adopting, is the bucket cover. All who have used them testify that there is a

great saving in using them, especially during a season of many storms. Besides the saving in that line, the quality of the sugar toward the last of the season is much better than when open buckets are used, as the hot sunshine does not warm the sap and sour it, as when unprotected. The scope of this paper is not confined to any one point in the maple sugar industry; and, as the subject as given is simply *Maple Sugar*, we propose to cover considerable ground, and, although somewhat thinly covered, we hope some hints will be thrown out which may be gathered up and utilized.

Speaking of *paying prices* (pardon me for bringing in my own experience) I will give some figures deduced from an account which I have kept with my sugar bush. Taking an inventory of sugar house and all the sugar tools, I charged the sugar bush 10 per cent. interest on the actual cost. I charged the cost of wood at $1.50 per 100 lbs. of sugar, and $1.00 for myself and $3.00 for man and team per day. Packages cost nearly ½ cent per pound. I placed no item for or against the timber land, but offset the growth against the interest and taxes. With my rig I find that on an average it costs me six cents per pound to make maple sugar, which, if sold at that price, would be considered a fair profit on the investment; all in advance of that price is clear profit to the sugar maker.

Some sugar makers may be able to make sugar at less than six cents, and I have no doubt that with some it costs more. The more expensive the utensils, the better they are cared for, and the closer the sap is kept gathered up and boiled, the more it costs to make the sugar. But the value of the sugar is enhanced, and the expense will all come back, and more with it, in the long run.

The maker of extra quality sugar who has a market for his product, has the advantage over his less fortunate neighbor, for he is getting some clear profit on every crop, and can afford to put in extra tools and time to produce the best possible grade for his special customer; and for his own interest he had better do it, or the first thing he knows he has lost that customer. I know a party who lives in an adjoining town, who thought some sugar which was not quite up to the standard would fill the bill with an old customer, who had placed an order, each year, for several hundred pounds for a number of years.

The pay came all right, and no grumbling, but that was the last order that sugar maker got from that source. One thing is evident, if we are to get and keep customers for any product, we must make the best we can with the advantages we have. Then improve our advantages, and make a better thing (if possible) this year than last. To illustrate, (pardon me for again speaking of myself) the party to whom I have sent sugar since 1889 has with one exception increased his order from year to year. His remarks in a letter to me, acknowledging the receipt of last year's consignment, were very flattering. He said it was the best lot of sugar he ever saw, and in giving his order for 2000 pounds this year he said, "Give me same quality as last year; no better sugar ever came to this market." Now I shall try and give him better. I said the sugar maker with a special market has the advantage over his less fortunate neighbor. Well, how did he come to have that special market ?

Answer, by advertising.

Sometimes, yes, quite often, it is done through some relative or friend living or visiting in a locality where no maple sugar is made, but many a good market has been established by the use of printers' ink. There are lots of people who, if they knew of some sugar maker to whom they could send for their supply of syrup and sugar, would do so, instead of buying at the markets where they are liable to get mixed or adulterated goods. But they will not send to us for it until they know of us, and they will never know of us unless we give them a chance, and advertising is the only means of reaching them. We have no reason to fear an overproduction of extra maple syrup and sugar, for the demand for such goods has and always will keep pace with the supply, but we do have reason to fear the unprincipled adulterater, who puts up syrup—no, glucose and black sugar mixed, melted and flavored to deceive,—in attractive packages, and labels them Pure Vermont Maple Sugar, when not one atom of the compound ever saw Vermont.

But that is not the worst of it. He does not hesitate to put the name and address of some Vermont sugar maker on the labels.

Sometimes from conscientiousness, or some other cause, he will

use a fictitious name and address.—Mr. Whitman found a package of syrup in a market while at Chicago, labeled Pure Vermont Maple Sugar, put up by,—(the name and town I have forgotten), but I remember the County, Cass Co., Vermont. There is no town by the name that was given, and if any one knows where Cass Co., Vermont lies, they will do Vermonters a favor by locating it.—There is now an infant in our midst, which if properly nourished, is destined to be a giant, which I believe can, and will, successfully cope with the adulterating evil. I speak of the Vermont Maple Sugarmakers Association, which is but little more than a year old. Every sugarmaker in this State ought to be a member, and provide himself with the Association's protected labels, and place one on every package of syrup and sugar he produces for sale.

The membership fee is small, and the cost of labels nominal. I sincerely believe that were all the sugarmakers to join hands in this work, the demand for our sugar would be wonderfully increased, and it goes without saying what the results in relation to prices are, when there is a strong demand. When I commenced this paper I intended to speak mostly about the making of sugar, but it has spun itself out to so much greater length than I intended, that I will close with just a few hints in that direction.

The sugar maker should provide himself with good, thoroughly painted wood or tin buckets. Wood are preferable to tin in this, they will not sour the sap as tin will on bright warm days. If covers are used—and they ought to be by all of us—the tin bucket is much the preferable. Any tinned or galvanized spout, providing it does not close the outer pores, or those next the bark, and will drive without injuring the tree, or breaking when driven or pulled, or one that will not slip the wire hook or pull out when the bucket gets full, is all right.

The drawing or gathering tub, or tank, (many prefer the tank) and the storage, should be of galvanized iron, tin, or thoroughly painted wood. A coat of fresh paint should be applied every three or four years to all wood utensils with which sap comes in contact. Nothing but white lead and boiled oil should be used. Then the arch, be it of stone, brick, or iron, should have a good draft. I would emphasize draft; if you haven't it, build the chimney higher.

Any evaporator that will boil with the least amount of sap—boiling surface considered—and work safely, is the best, as the quicker the sap is reduced to syrup or sugar, after it is once heated, the whiter and better flavored the product will be. A steam escape, conductor or draft—call it what you may—that will take all the steam out of the sugar house is a very desirable thing to have, especially on a still, foggy morning. The sugaring-off pan should always be made of Russia iron. Take no other, even if it is offered you for nothing.

Now we will proceed to tap the sugar place. Ross the bark lightly, on the thriftiest spot you can find, and when you bore the hole, don't go too deep, as the sap from the outer grains makes the whitest sugar. When there are two to six quarts of sap in the buckets, start the team to gathering, and boil at once if you want to make a No. 1 syrup and sugar. If the weather is getting warm, and sap is accumulating in the holders, a cake or two of ice will keep it cool, and prevent its souring.

When you have syrup, filter it hot through felt. That will take out all the "niter," and if you are to put it up in cans, do so at once, and seal it while hot, and it will never spoil. If for sugar, "sugar it off" as soon as you have enough for a batch.

Wash the evaporator and sugaring-off pan as often as possible, and change ends with the evaporator if it is that kind.

We will now suppose that we are near the end of the season; sap don't run much, only drizzles part of each day, perhaps to the amount of a pint to two quarts per tree in 24 hours. We had better gather the buckets at once, unless we want the stuff that the sour, buddy sap will make for our own use, for it never should be put on the market. That is one thing that hurts the maple sugar trade. Suppose a party in Philadelphia, or any Western city, should read or hear of the delicious Vermont Maple Sugar, and should decide to buy some, and give himself and family a treat. He calls on his grocer, asks him if he has any Vermont Maple Sugar, and, receiving an affirmative reply, orders a 10 lb. pail sent to his house. On reaching home he tells his wife and children that they are to have the best treat they ever had, for (he says) I have ordered some of that Vermont Maple Sugar we were talking about this

morning. It arrives, they put some on the stove in a bright tin pan to melt, and when it is boiling up nicely they dip out some and take their first taste of Vermont Maple Sugar. They don't look happy, and don't eat much of it, nor make any complimentary remarks about it. What is the trouble? It is made from the last run of sap in somebody's sugar place, after his buckets ought to have been washed and put up. Some time ago, I read an article in one of our papers, I think it was from the pen of Mr. Timothy Wheeler, in which he urged the point of closing up the sugar making before any black, strong sugar was made, that we should be tempted to sell for what we could get for it. He said, among other things, that in one sense, a successful preacher, and a successful sugar-maker were alike. They both knew when to stop.

# NOTES ON MILK.

BY HENRY E. ALVORD, OF SPRING HILL FARM, FAIRFAX COUNTY, VIRGINIA.

Nearly everyone attending a public agricultural meeting in New England, may be assumed to be interested in milk production, or in the handling of milk and its products. Therefore, although milk is a well-worn topic for such an occasion, it may be allowable to repeat some facts familiar to dairy meetings. My object is to renew an interest in the study of milk on the part of those who produce it, or handle it, or use it, so as to cause them to pay closer attention to every part of the subject or business.

The first inquiry may properly be as to the formation and composition of milk, and the nature and peculiarities of its different parts.

To the naked eye, milk appears to be a whitish, opaque fluid, of a perfectly homogeneous nature (as first drawn from the cow), but upon being examined with a microscope, its true physical character is revealed. Milk is thus shown to consist of a thin watery fluid, in which are suspended myriads of minute globules, round or ovoid in form and differing in size. These globules are minute particles of fat, and to their presence is due the butter value of milk. Different milks differ much in the quantity of fat contained in these globules, and also in the relative size of the globules themselves. In some milk they are much more uniform in size than in other milk, and in some milk they average twice as large as in other milk. By a very ingenious but simple apparatus these fat globules have been accurately counted and measured in many different samples of milk. They are thus known to vary from 1–4000th of an inch to 1–1500th of an inch in diameter.

If we can imagine a lot of these minute globules of fat to be strung along in a line, touching side to side like so many little

beads, it would take from 1500 to 4000 of them, and sometimes 5000, to cover an inch in length. The uses to which milk can be put, the adaptability of different milks to different dairy purposes, and the commercial value of milk, depend almost wholly upon this fat. The quantity of fat or total number of globules in a given quantity of milk, and the size of the globules, determine the value of the milk. The fluid in which the fat globules appear to float, or are suspended, consists of water (in large part), which holds in solution a substance called caseine, which is the curd or cheese-matter of milk,—sugar or "milk-sugar," from which milk derives its sweet taste, and some mineral matter, or salts, which somewhat contribute to its flavor.

The fat, caseine, sugar, and salts or ash collectively, form the solid matter in the milk, and are known as the solids of milk, and are generally called the "total solids." The caseine, sugar and ash are spoken of collectively as the "solids not fat." All the rest of milk is water, and—roughly speaking—average cow's milk consists of 7-8ths water and 1-8th solids. This is easy to remember:— in a gallon there are eight pints, so in every gallon of milk there are about seven pints of water, and about one pint of solid matter.

To make this plainer than words alone can do it, I have arranged here, in jars, one gallon of average cow's milk and its component parts. [Jars exhibited and explained.] The first jar contains a gallon of milk. The next two jars, of equal size, contain the water in one and the solids in the other. In these four smaller jars are the different parts of the milk solids. It may be well to go over this part of the subject again carefully and with more accuracy.

One gallon of milk contains four quarts, weighing not quite 2.16 pounds each, or 8.625 pounds,—just about 8 pounds 10 ounces avoirdupois.

The water varies from 90 per cent. to 84 per cent. of the total bulk or weight, averaging 87 to 87½ per centum. The less water in milk the more solids. The best milk is that which has the least water.

The total solids range, ordinarily, from 10 to 16 per cent. and average 12½ to 13 per cent. The more solids the better the milk; the solids give milk its food value.

The sugar is usually the greatest in quantity of the several parts of the solids, but is sometimes exceeded by the fat. The sugar ranges from 4¾ to 5 per cent. and averages 4 4-5 per centum. It is all dissolved in the water, and is the least variable of the solids in its quantity or proportion to the whole. The water and sugar mixed would be a colorless, transparent fluid. The manufacture of milk sugar from milk (skim-milk)is now a considerable industry in this country ; the sugar is largely used by druggists and in numerous delicate food preparations.

The fat is the most variable constituent of milk. It ranges ordinarily from 2½ to 5 per cent. not infrequently being 6 per cent. The average may be placed at 3 to 3½ per cent. The fat gives to the milk its quality or richness, and nearly all its color or opacity. All the yellow color of milk, cream and butter, is in the fat, but is not an essential of the fat ; there may be a maximum quantity of fat, and yet an entire absence of the yellow color. The most important characteristic of milk fat is its great variability in quantity. In order to emphasize this, two jars of fat have been added ; the three now show this variation as it commonly occurs, and this difference in the quantity or proportion of fat, almost independent of changes in the other solids, makes the difference between poor milk (2½ per cent. or less, of fat), average milk (3 or 3½ per cent.), and rich milk (5 to 6 per cent. fat).

The caseine ranges from 3 to 4¼ per cent., averaging about 3 2-3 per centum. It is thus rather more variable than the sugar, but much less so than the fat. This is the curdy portion, or cheese, of milk ; it is albuminous in character, and the particularly nutritious portion, upon which the food value of milk almost entirely depends. (Chemists treat the albumen of milk as a distinct part, but for all practical purposes this may be included in the term caseine). The caseine is nearly all dissolved in the water, but a little of it is in finely divided insoluble particles. If these jars of water, sugar and caseine should be mixed, the resulting fluid would be not quite clear,—what might be called "murky," but still practically transparent.

The ash is always about three-fourths of one per cent. of the milk, varying very little. This is the mineral or bone-building

part of the milk, and it, also, is nearly all dissolved in the water. Without going into too much detail, the ash includes potash, soda, lime, iron and magnesia, in combination with muriatic, phosphoric and sulphuric acids. The phosphate of lime is the part which does not freely dissolve in the water.

The component parts of one gallon of average milk may be thus stated :

| 1 GAL. MILK. | WATER. | SOLIDS. | SUGAR. | FAT. | CASEINE. | ASH. |
|---|---|---|---|---|---|---|
| 138 oz. | 120½ oz. | 17½ oz. | 6¾ oz. | 4¾ oz. | 5 oz. | 1 oz. |

Now to repeat, the water holds almost entirely dissolved the sugar, caseine and ash ; these mixed would still be transparent but for small parts of the caseine and ash. These parts form a fluid sometimes called the *serum* of milk, which is, as a whole, a true *solution*. The fat is semi-solid, and its globules or particles never unite chemically with the fluid or serum, but are mixed with it, and fluids and fats form what is known as an *emulsion*. The greater the proportion of fat, the richer the milk, the more opaque or "thicker" (perhaps the whiter) it appears. If the fat is gradually removed from the milk, it becomes poorer, thinner or more watery in appearance. The difference between fresh or "whole" milk and thoroughly skimmed milk is familar to the eye. There is no mechanical contrivance which separates all the fat particles from milk ; if this could be done completely, the fluid remaining would be almost as clear as water.

These facts as to the component parts of milk assist in explaining how milk is formed by nature in the mammary glands of the cow. The udder may be described as composed of four physiological glands, familiarly known as "quarters." These are all more or less connected, but the relation is more intimate between the quarters of the same side, than between those of opposite sides. The quarters closely resemble one another in construction, and milk-making is carried on alike in the four. Each gland is composed of a mass of minute cells, supported by tissue, and connected with little ducts which join, and form larger ones, coming together in one canal leading to the milk cistern just above or at the base of the teat, or main valvular outlet of the quarter. The four are more or less

surrounded, connected and covered by tissue of a fatty character, with skin over all and the four outlets or teats.

The udder should not be likened to a vessel, a "bag," or even a sponge. It does not hold any appreciable quantity of completed milk at anyone time. The milk cisterns, where alone completed milk can be found in the udder, and this of very poor quality, are quite small, the four together seldom holding more than a pint. The glands, between the milkings, bring together the materials, store up a considerable quantity of the serum or fluid portion, and prepare to make the milk. In the cells of the udder, the fat globules are formed. They are parts of the anatomy of the cow, like the fat in other parts of the animal body; they form by the budding process, ripen, loosen or slough off, and are then moved along, floated by the serum through the ducts and channels to the cisterns. This final process, the mixing of fats and serum in due proportion to make milk, occurs almost wholly during the active operation of milking. The distended udder may indicate that the cow is ready for milking, but it is not true that "the udder is full of milk." There is practically no fully formed milk in the udder when the teats are seized by hand or calf. The milk-making by nature, is co-incident with the act of milking.

This explains the oft-observed fact, that the first milk drawn from a cow, after the usual interval, is thin, poor, deficient in fat (globules), while the quality of the milk improves as the milking proceeds, and the last drawn, or "strippings," is the richest—like rich cream. The serum is formed and moves in advance of the fat globules and milking ceases when the glands cease to supply the fluid in which to float the fat globules from the vesicles or epithelial cells to the outlets. This also explains the reason why the oftener a cow is milked (within limits) the richer the milk obtained. Further, the fat globule being so closely related to the anatomy of the cow, it may be understood that the size and number of these globules, and hence the quality of the milk, is a matter of inheritance, or a breed characteristic. A cow descended from a family or breed noted for milk rich in butter fat, is almost certain to possess this characteristic of richness of milk; if she ever gives

rich milk, she will always give it, be the quantity of milk great or small.

We know very well that fresh milk cannot be kept long in its sweet state except by special methods of preservation. Sooner or later it becomes sour. This is due to some controlling influence which acts first, as a rule, upon the milk sugar, and causes it to form lactic acid. It may be the heat of the weather, some peculiar effect of the cow's food, peculiar conditions of the atmosphere, or contamination of the milk by exposing it to bad or unusual odors, which hastens the souring, or determines the time and activity of the change. In some cases the caseine may be the agent to bring on the change. There has been, heretofore, a very general belief among people handling milk that, like original sin, the cow conveyed some property to milk known as animal heat, animal odor, etc., which was detrimental to it, and hastened its destruction. This theory has been fully disproved. Some of the Agricultural Experiment Stations have been specially studying the changes and fermentations of milk, and these investigations clearly show that minute germs or organisms known as bacteria are the active agents by which these changes are brought about. Several species of bacteria have been determined in milk and about dairies, each having a specific effect, and these respectively cause acid milk, thick milk, ropy milk, blue milk, etc.

Twenty years ago no one would have supposed that "the germ theory" of disease had any bearing on dairying, or that bacteria had anything to do with milk. But bacteriology has become a science of itself, with a voluminous literature, and we find that some branches of this research have become very practical, and of direct importance to all who handle or use milk and its products, in quantities large or small. The characteristics of bacteria cannot be well described here; so much has lately been written of them that it may be assumed that the nature of bacteria, their wonderful powers of increase and something of their effects, are generally understood. Based upon recent investigations of the bacteria of the dairy, some very positive statements can be made which would not have been possible a few years ago.

The idea that the souring of milk is a natural process, and certain

to occur in time, without the intervention of outside influences, has been shown by this new knowledge to be entirely erroneous. In pure milk, drawn from the udder of a healthy cow, there are no germs of decay or demoralization; but all the changes and fermentations of milk, including common souring, are due to the contamination of the milk with something from the outside, after the fluid leaves the mammary glands of the cow. These organisms all get into the milk from the air, the hands or clothing of the milker, the hair, skin or udder of the cow, and especially from the vessels into which milk is drawn, or in which it is placed while still warm. It is plain, therefore, that the number of mischievous germs present in milk will vary much with the cleanliness used in the dairy and barn. This explains fully why milk from a clean and well-kept dairy "keeps" so much better than when handled with less care. These points have been experimentally demonstrated. Milk can be drawn from cows so carefully, and kept so free from contact with air and any living germs, that it will remain perfectly sweet and unchanged for weeks, although kept in a warm room.

This knowledge of the cause of milk changes and the varied nature and effects of the bacteria of the dairy is of the highest value. It is of practical application not only in the treatment of new milk, but in making and handling butter and cheese. Great advances in dairying are to come from it, which cannot yet be fully determined and described.

We speak and think of milk, generally, as a fluid or a drink. But milk is really a food, not a drink, and should always be regarded and treated as a food, and valued for its food qualities. The solid parts of milk alone have value; these are what we want when we buy milk and when we use it. The solids should also be the end and aim of all who produce milk. The more solids contained in a pound, a pint or a gallon, the more food value contained. This fact is recognized by laws in the different States, which base the legal standard for pure milk upon the percentage of the contained solids. The standard varies from 12 to 13 per cent. of solids, in different States.

In referring to milk as a food, we at once notice that it combines the three elements required for human life and growth—ash for

bones, fat and sugar for heat producers, and caseine (and albumen) for flesh-forming. And milk, which is such a perfect food in right proportions, is the only article supplied by nature for the young. Reject the ash or mineral matter, and milk remains the most natural food for man during all parts of his life. Moreover, nearly all mankind like milk in one form or another, and will use it freely if they have it in abundance. This being true, it is very strange that so little cow's milk is used as a part of the food of individuals, and of the family supplies. This seems stranger still, when, upon careful comparison, we find that milk at the prices at which it is usually sold, is the cheapest of all foods. Fresh milk, or cheese made from it, which a dollar will buy in any market in this country, contains more material having actual food value, than any other food material which can be purchased for a dollar in the same market. Moreover, this milk is in a form more readily digestible than any other food. And further, the milk and its products can be more completely used, that is, consumed or prepared for use, with less waste than almost all other food.

The food value of milk depends upon its curd rather than its fat. All caseinous, nitrogenous or flesh-forming constituents of food are worth more and cost more (in whatever form) than the fatty, carbonaceous or heat-producing constituents; the former occur in large proportion in milk, and in still greater proportions in skimmed milk. The food properties of milk fat, of cream and butter, can be obtained in numerous other forms or substances, at less cost than in these dairy products. But the food elements of cheese, curd or skimmed milk can be had in no other form so cheap. Dairy products as a whole are among the most wholesome, nutritious and economical of foods, and of all these, skimmed milk and skim-cheese are by far the cheapest and best, measured by their actual nutrition or food value. On the other hand, the true food value of cream and butter is so low, that these articles should be classed as luxuries rather than as foods. Strange as it seems at first, it should not be forgotten that a pint or a pound of skim-milk is worth more, as food, than a pint or a pound of fresh, or whole milk,—because the former contains the greater proportion, in the curd, of the most nutritious elements. As skim-milk al-

ways sells at much less per quart than whole milk, it is, of course, very much the cheaper form of food.

Milk is an animal product or animal food, and can best be compared with other animal foods, of which class fresh beef is a standard. In studying the question of household or food economy in this country, we usually find an unfortunate and unreasonably low consumption of milk accompanying a liberal and extravagant use of butcher's meats. By a thoroughly accurate and reliable comparison, based upon their nutritive properties, it has been shown that two quarts of fresh milk have more food value than one pound of good, lean, fresh beef. And as beef is usually cooked and eaten, the nutrients obtained from the purchased pound are little, if any, more than contained in one quart of milk. Three pints of skim-milk hold more nutriment than a pound of beefsteak. And one pint of skim-milk is worth more, for food, than a mutton-chop weighing a quarter of a pound. In these several cases, the milk as ordinarily retailed, costs only one-half to two-thirds as much as its food equivalent in meat.

In nearly all human foods and combinations of foods, as commonly used in this country, there is too much carbonaceous or heat-producing material, like starch and fat, for our best physical condition. And when, in rare cases, more of the heat-making elements are needed, they can always be obtained in cheaper and healthier forms than animal fats, including the fat of milk. The statement may therefore be repeated and emphasized, that for most persons, and for nearly all periods of life, skim-milk is a cheaper and better article of food than whole milk. Aged persons must be excepted, as it is well known they require a very large proportion of heat-producers in their food. And with very young children, living almost wholly on milk, a reasonable amount of fat or cream must be allowed. Yet it is a fact that cow's milk, in its natural state, is generally too rich in fat for infants, and should be partly skimmed; this is far better than diluting it with water.

With all these facts, which cannot be disputed, it seems very strange that such a prejudice exists against skim-milk. This prejudice even goes to the extent of prohibiting its sale in some places. In the States of New York and Maryland, for example, it is

criminal offense to sell skim-milk in the cities and towns. In the cities of New York, Brooklyn and Baltimore, as well as other places, the Boards of Health,—whose members really know better, —enforce the laws so as to seize and destroy all skimmed and half-skimmed milk offered for sale. By this absurd and really wicked action, the people of those cities are deprived of a wholesome food, which might be sold at prices making it an actual blessing to thousands of the poorer classes. Such milk should certainly not be sold fraudulently as whole milk, but it is not difficult to regulate the trade so as to prevent fraud. The sale of skim-milk, as allowed and practiced in Boston and Philadelphia, saves the citizens of those cities many dollars annually, besides being of very great benefit in a sanitary point of view.

It should be noted that what has been said of milk and skim-milk as human food, applies to the feeding of all animals on the farm, and especially the young animals. The feeding value of skim-milk on the farm should be especially studied, both alone and in combination with other foods. In creamery and butter-making districts, where there is so much of it, the best use of skim-milk is really a matter of great importance. Butter-milk has, usually, as much feeding value as skim-milk, and sometimes more, but this is not because of the greater proportion of fat in it.

The time given to this branch of the subject is justified by its importance. The value of milk as an article of food, on the farm as well as in the town, is not fully appreciated. Everywhere its consumption could be largely increased to good advantage. And this is even more true as to skim-milk. As an article of local trade, in the supply of cities and towns, in household economy and the family dietary and on the farm,—skim-milk should receive more attention and be used largely and judiciously.

HENRY E. ALVORD.

January, 1894.

## DISCUSSION.

Mr. Sanford—I would like to ask if the skim-milk that we get from the creamery is included in your remarks, or do you refer to separator skim-milk ?

Maj. Alvord—The difference between separator skim-milk, whether from the factory or separated at home, and the skim-milk from the old-fashioned system of setting milk is what is asked. The deep-setting system of caring for milk don't change the relations of the constituents much, although it may separate more fat. There was more fat left in the milk in all the old ways of creaming or separating, and especially by the shallow-setting methods. The milk is more opaque than in the deep setting, and that means more fat globules in it. A separator, if properly watched, will take out more fat, practically all of it. But there is another difference in the separator milk; something has been taken out which one finds sticking to the bowl of the separator; it is a thick, slimy, offensive material. The chemists disagree as to just what it is. Asked what it is good for, they say fertilizer. Now by the old process this material is all left in the milk, but by the separator it is taken out. This may, and probably does, contain albuminoid matter—we might say that the separator milk, on this account, is not quite as nutritious as the home-set milk, but I think it is nearly as much so.

Mr. Winslow—There is one question I would like to ask. There are in the samples shown, three different proportions of butter fat. Now if we had three gallons of milk there, with this difference in fat, would you have the same variation in the caseine, sugar and ash in every gallon, or would the main difference be in the water ?

Maj. Alvord—It would be in the water. In the case of the ash you might find a very little difference, but hardly noticeable. In the case of the caseine, you would not notice very much difference. The same is true of the sugar. But where a difference does occur, the change generally follows the fat. In extreme cases, as

where you get six per cent. or over of fat, you may find increase in the other solids.

Mr. Winslow—Then the increase or decrease in the caseine accompanies the increase or decrease of butter fat ?

Maj. Alvord—Usually so, and this fact was brought out well in the dairy contest this year. In the case of any one cow, her milk increases in the per cent. of its solid contents, as her milking period advances. When she has been milked eight months it will be greater than when she has been milked but three months—at the same time, the quantity of milk usually decreases. But in a herd it is different. The way to change a herd to producing more butter fat, is to increase the quantity of milk.

Mr. Sanford—In a milk that has a four per cent. fat and a three per cent. caseine, will a five per cent. fat carry a four per cent. caseine ?

Maj. Alvord—No, the increase of caseine would not be so great, and, indeed, in the case you name would probably amount to little.

Mr. Sanford—Is it an assured fact that the coloring matter is derived from the green coloring matter of the food ?

Maj. Alvord—No, but there is a close connection betwen the two. The butter is higher colored if the cows have green food, but at the World's Fair the Guernseys, that had not eaten a particle of green food for a year, gave butter rich in coloring matter, while with both the other herds they used artificial coloring for their butter. The Jersey needed less than the Short-horn.

Mr. Gabrilson—Would you say the Jersey butter took the lead as regards hardness, over the others ?

Maj. Alvord—At Chicago, cold blast was used to help make the butter of any hardness. This was because the butter-making room was so unsuitable. In texture and flavor the Jersey butter was clear ahead.

Mr. Gabrilson—Do you understand that if a herd of cows be kept on dry food, and then turned out to grass, and the milk increased—that there would be an increase in fat ?

Maj. Alvord—There should be, and almost always would be, an increase of butter fat.

Mr. Winslow—Do you mean that as the milk increases the fat does ?

Maj. Alvord—If the cows are well fed. If our pastures do not furnish as good a food as the barn food, and still the pastures stimulate a larger flow of milk, there may not be the expected fat increase. But if the pasturage is as well balanced as the food in the barn, the milk should increase in fat as it gains in quantity.

Mr. Winslow—It is a generally accepted opinion, that the less the milk flow the more rich it is.

Maj. Alvord—This may be true with a single cow ; we know very well that a cow that has been milked for six or eight months usually gives milk having a higher per cent. of fat than when she was fresh.

Question—Does it make a difference the longer you strip a cow —will the milk be richer ?

Maj. Alvord—I mean that the milk becomes richer as you progress in her milking period.

Mr. Williams—Is there any trouble in keeping butter fat ?

Maj. Alvord—There is no trouble in keeping pure fat. I recollect that thirty years ago, when in the army, we used to do things we should not have done. We used to go on foraging expeditions, and we occasionally searched houses. I recollect finding stone jars of butter put away in the attic. The butter was usually in an oily state, and we would find salt and curd in the bottom of the jar, and on the top would be some mould, but in the middle of the jar would be the pure butter fat, and it would be sweet. Pure butter fat will keep almost indefinitely. Butter is 80 to 85 per cent. pure fat.

Mr. Williams—Is the fat of the milk lost in cheese-making ?

Maj. Alvord—No, at least it need not be and should not be. By the old processes fat was lost out, but by the improved process of cheese making the richest milk can be used, and put all the fat into the cheese. The richer the milk the higher per cent. of fat in the cheese, and, if well cured, the higher the grade and price of the cheese.

Mr. Spear—Can this rich milk be converted into marketable cheese ?

Maj. Alvord—Yes, and bring almost double the price of the poorer article. You will find in the Wisconsin bulletins an account of Dr. Babcock's work in this direction.

Mr. Spear—Would that hold true if the milk tested three or four or five per cent. fat ?

Maj. Alvord—Yes, undoubtedly. There was an instance in the State of Maine where they had been noted for the butter stock that they had, and they established a cheese factory, and got something over twelve pounds of cheese to a hundred pounds of milk, while most cheese factories make ten pounds to a hundred pounds of milk.

Question—I would like to ask if the quality of this milk was produced by breed or pasture ?

Maj. Alvord—The breed was the chief factor. It was the milk being richer that gave this result. They were the Maine State Jerseys, and every one had a record back of it.

Mr. Packard—Have I understood you right then, that the better a cow is fed, the better the milk will be ?

Maj. Alvord—Up to a certain point ; after that it is not so. Two years ago we would tell you we could not feed a cow so as to increase the fat, but now we believe we can—but only by increasing the quantity of milk.

Mr. Vail—How do you account for the different flavors of the butter from different herds ? Some would say it was the bacteria that affected the flavor mostly.

Maj. Alvord—That quality certainly belongs to the animal, and might or might not belong to bacteria. I have not been able to make as close a study as to the causes and effects in connection with feeding and flavors, at the Chicago test, as I would like to do. The Short-horns, in order to compete, with the large amount of food they must consume, used cheap food, and the cheapest was silage. The Short-horns used this at a cost of $2.00 a ton, and they used fifteen times as much as the Guernseys or Jerseys. Yet the Short-horns were scoring the highest in flavor, just at the time they were eating this miserable stuff. Another fact is this : I selected from the 90-days test, and from the 15-days test, the samples of butter which scored 95 per cent. and over, and found that this butter con-

tained a large per cent. of water; and when the butter scored the lowest, the butter contained less water. As to the flavor of the butter, there is a very close relation to the per cent. of water, and the more water the better we judge it to be.

Mr. Vail—Does it seem to indicate that the flavor of the butter is finer if there is more water present, and is affected as well by that as by the bacteria?

Maj. Alvord—I think so.

Mr. Gabrilson—It has more water to the hundred pounds—is a harder butter.

Mr. Williams—Do I understand that skim-milk is richer—rather that it has more nutriment? Will a calf thrive as well on it as on whole milk?

Maj. Alvord—Yes, if it is old enough to eat hay and other food. It will not make as satisfactory veal,—but there is more nutriment in the skim-milk, and as a food it is worth more by the pound. You can feed other things with the milk that will take the place of the fat removed from it.

# POULTRY.

## EAST BETHEL INSTITUTE.

Mr. Gabrilson—The poultry industry of the United States is one of wonderful magnitude. We don't realize this because it is made up of so small individuals. Edward Atkinson tells us that the egg industry is worth more than the gold and silver industry of the land. Two hundred millions of dollars a year for eggs alone. We import about fifteen million dozen eggs—which is one of the industries we ought to protect ourselves against by raising in our own country. We import from France, Belgium and Canada mostly. Eggs can be transported cheaper from France than from Iowa, at least it was so five years ago. The importation of the flesh of the poultry is also great.

The question of a poultry house and protecting from vermin is one of great importance, but I have found the simplest way to get rid of them is to pour kerosene right on the roosts. Another way is to burn sulphur in the building, by putting it on coals. We can use the same means for removing lice from the cow stable, or anywhere.

J. M. Bennett—I built a hen house this fall, but have not succeeded in getting any eggs. It is two stories high, and tight. It has four rooms; dirt floor. The folks that take care of it have kept hens under sheds for years and had great success, yet these hens have better care and we don't get any eggs. I have about half as many hens at home, and they are not cared for half so well, and I get a dozen eggs a day; still these others don't lay.

Mr. Sanford—What do you feed?

Mr. Bennett—Bran, corn and meat.

Mr. Winslow—It is nothing against the hens that they don't lay, it is the breed. There are winter laying hens and summer laying hens. If you had bought early laying chickens, you would have had eggs. You will have volumes of them next summer.

Mr. Gabrilson—The next question is, is the house warm? It should be about the temperature of April. At home we put on storm windows to keep the house warm. I never had such good success as I had one winter when I kept sheep in a cellar next the hen-house, so that the house was warmed from the sheep somewhat. Mr. Arms has a son who is devoting himself to the care of these hens, so that they can't help laying. But really the question of temperature has so much to do with the laying of eggs that we cannot afford to disregard it. It would be well to have them where they can get the direct rays of sunshine.

Mr. Sanford—If a hen is a little too fat she won't lay. She has to be in good working order, and must have a good bringing up. It depends on a lot of things. So we can lay down general principles, and they are generally correct.

Mr. Bennett—What is a fair average for a hen a year?

Mr. Sanford—I don't know. We keep about 150 hens, and my son says he has made $400.00 a year. He takes good care of them, and we are near a good town, where he gets forty cents a dozen for the eggs.

Mr. Stiles—It seems that this hen question is getting very interesting. It is a fact, that the poultry business has become a great industry in New England. When we hear about their importing so many eggs, it seems as if this country might raise its own. It used to be the fashion for the farmers to keep a few hens for their own use, and they did n't think of selling their eggs. We can transport eggs all over the world now, but seventy-five years ago it could not be done. Some people like hens, and some don't. A man said it cost him three cents to get an egg; on the contrary, our hens have furnished us with all the necessaries this summer—our flour and all our groceries, and a good deal besides. My son is a man who loves a hen, and he believes that a hen will do well if she is kept until three or four years old.

C. S. Paine—The question is asked: How many eggs has a hen been known to lay in a year? I keep a record of my hens, and find that they laid two hundred and twenty-five eggs, and raised quite a lot of chickens. The next year I tried to do better, and did n't do as well.

J. G. Fowler—I am not a hen-raising man, and know of them only as I hear my wife and daughter talking. They do a business in a small way, keeping thirty or forty hens a year. I heard them say the other day that their hens were troublesome. We live in the village, where my neighbors don't like them in the garden, so that we are obliged to keep them shut up all the year round. It needs careful attention, and somebody who cares for hens, and who likes to bother with them, if they are to do well. We have had a good deal of contest over this hen question at our house; but if you should go down to our house you would see a Vermont Register with the number of eggs for each day set down, and so much cracked corn, whole corn, oyster shells, wheat (scorched or rejected) and everything of the kind, accounted for. They warm the water and warm the feed, but I don't very often get into the hen house. Their hen house has a ground floor, and two good yards. These hens lay constantly the year round, and they think that if you want to be sure of winter eggs you should prepare for it this winter, and so they put up boxes to set the eggs in in March, and want the chickens out the first of April. They keep pullets for laying. When they killed the old hens this fall they dressed five or six pounds each, and were laying right along. These pullets are trained pullets, and are all named. They are tame and like to be talked to. Now my wife and daughter have become quite expert in doctoring their hens. Last fall one of the hens had been out and eaten too much grass after it had been cut by the frost, and they took that hen, cut open the crop, took out the grass, sewed it up again and let the hen go. In a few days she was all right again. Their treatment is generally successful, but sometimes a hen will die.

## FAIR HAVEN INSTITUTE.

Dr. Twitchell was called out to occupy a few moments and spoke as follows:

### POULTRY FOR THE FARMER.

Among all the varied departments of animal industry not one has such general application as the poultry. Everybody on the farm and in small villages keeps a flock, some for pleasure, some to keep

peace in the family, some for profit. In spite of abuse and neglect no class of stock yields so sure, or so large a return as hens. It seems a little matter, too trivial to be worthy attention, yet to the State of Maine it is yearly worth millions of dollars. Shipments of eggs from single villages aggregate over two hundred and fifty thousand dollars yearly. Thus we see that the industry is small, only when we think of the individual animal. As an industry it is one of the largest in New England, and because adapted to every portion, fitting into the life of every man, no matter how humble, calling for but a small expenditure in starting, it is to be encouraged and strengthened in every way possible. The limit of the industry cannot be imagined, and such a thing as over production is well nigh among the impossibilities. I do not wish to speak as a specialist, although having bred pure bloods for almost thirty years, but would plant myself by the side of the man struggling on his farm to lift the burden of debt, anxious to educate his children and add to home comforts. He is the man I would reach out to and assist, he is the one this Board of Agriculture should encourage. We have been making history rapidly the past ten years in all agricultural research, and to-day there is hardly a text book in line with the progressive work done on our farms. It is to the regular weekly and monthly publications we must turn for the lessons brought to date. Especially is this true with poultry culture. General principles remain the same, but details are all the while being modified as men come to a knowledge of the science of the industry. We are learning that it is not so much a question of breeds as of men, that the animals under our care were given us to be controlled, directed, changed according to our knowledge of the laws governing their habits and characteristics. Hens are machines, and, while the process of manufacture may be a mystery, the fact remains that the better man understands and appreciates the care, the purposes and the ability of the machine, the better will be the results. Breeds, in their variety, furnish the evidence of this controlling influence on the part of the enthusiastic men who have changed, modified and directed form, color and functions to suit their purposes. The capacity of a hen is your capacity. If you can grasp 250 eggs yearly the hen will pro-

duce them, and if 100 is your limit it will not be exceeded by the flocks. As everywhere else, the great fact stands out that it is the individuality of the hen, rather than the general type of the breed, which is to be noted. It is for these reasons I place breed secondary, and in so doing, I do not undervalue pedigree but dignify it. The farmer with his many duties will realize more dollars, and find greater freedom from care, by keeping grade hens and using always a pure bred male. The reasons are obvious. If one attempts pure bloods he must have a knowledge and an appreciation of the work of the specialists who established the variety, and be prepared to give time and thought to the study of improvement through combined blood lines. On the other hand, starting with grades, one can avail himself at small expense of all the results gained by the specialist, by the purchase of a pure bred male; and following a single line year after year, that is, using a male of the same variety—a family will become established and can be readily maintained. The poultry specialist, like all others, is a public benefactor; he brings within the reach of the farmers the best blood of the country.

To-day there is more money in eggs than in poultry, unless your home markets are open for broilers, and you have a taste for that special line of work.

If eggs are wanted, select hens built on approved egg-making plans. The longer, slimmer body is wanted, the legs nearer together, with good depth through the central portions. A long springy rib for a dairy cow, and also for a laying hen. All the functions connected with maternity call for a form adapted to the purpose. Select breeding stock with this single thought in view. If you want poultry, then surely a different conformation is called for. It is a short body, deep and full in breast, legs wide apart, ribs set at more acute angle so as to allow width of body and abundance of breast meat. Such a body is built for meat making, not egg building, and to-day with sharp competition hemming us in on every hand, the distinction becomes necessary between the two forms. On the one hand a production of fifteen dozen yearly is called for, and on the other a rapid growing body to weigh one and three-fourths to two pounds at ten weeks, two and one-half to three pounds at twelve to fourteen weeks, and five to six pounds at four months

and a half. Remembering, as we must, that the currents of the body are easily controlled in early life, and when once set are not to be changed, the necessity is apparent for starting and holding to a distinct purpose. Many a good dairy cow has been spoiled during calfhood by having the natural currents of the body turned in the direction of fat-forming, through generous feeding. Again, I say, the great study must be to learn the individuality of our animals. There are more 300 lb. cows in our dairy herds than we dream of, and more fifteen dozen hens, the trouble being with the owner, who, failing to appreciate the situation, prevents his animals from doing their best by injudicious care, mating and feeding. An egg is so much lime, soda, iron, phosphate, phosphorus, sulphur and albumen. It is made by feeding these elements in natural form to the hens. Years ago it was corn meal or whole corn, oyster shells and ground bone, dried. Had I known the value of clover and green bone, I could have saved myself thousands of dollars. Not knowing, I fed after the custom of the day, and lost in increased expense, also in decreased production. I put in as food what served as a check to egg making. Now we are learning that green bone and green clover are almost perfect egg foods, that they are easily digested, that they should form the bulk of the daily ration, and that in filling the crop, something necessary for health and comfort, not over one part in seven should be of grain, whole or ground. I found that an ordinary pail, holding about seven quarts, filled with cooked food was ample for thirty to thirty-five hens, for their morning meal. Of this not over a quart, or at most a quart and a half, would be of ground grain, mixed—corn meal, oats ground and bran or middlings—the pail being filled with cooked clover or vegetables chopped. Feeding this early in the morning, I gave a cabbage at noon, and by the middle of the afternoon one quart of whole mixed grain, to seventeen hens. This was my cold weather ration. In the summer I gave no corn, and but little whole grain, only oats and wheat at night. One word of caution here, and that is to avoid poor or damaged grain. Feed what is healthy and safe. The product is but the result of the food given. An egg is made out of what you feed the hens, and what they pick from the manure heap and under the sink spout. Make it the rule to feed the hens as

soon as they come from the roost, no matter how early that may be, and feed as early Sunday as Monday. Regularity pays as well in the poultry yard as in the dairy. Cook the morning feed the day before, and then cover tightly so as to keep warm until fed. If you find a hen an hour after feeding sitting around on the roost, or huddled in the corner, you may know she ate too hearty a breakfast at your expense. This is a little thing, but in a flock of one hundred, continued day after day, it tells the difference between profit and loss. An active hen is a laying hen, a sluggish one never.

In spring colonize over the farm. Build inexpensive houses which two men can easily carry, and get the flocks into these among the trees in the orchard, or out on the pasture lands, no matter how rough and rocky. I have used houses 8 feet long, 4 feet wide, corner and centre parts 2x2, 3 feet high, a base board, and the ends and back side clapboarded, also the double roof. Lath the front and have a little door cut in one end. Inside place a roost and the laying boxes. Such buildings can readily be moved once a week, and everything kept sweet and clean while the winter quarters are being fumigated and made ready for occupancy in cold weather, the cost for material being not over $1 each. Let me urge that during the coming season the business be extended, the flocks increased, the pens kept sweet and clean, and the great question of rations be carefully studied, that we may approach the minimum of expense in feeding, by mingling the right constituents in the daily ration, and so reach the maximum of production and growth. As soon as the broods are weaned, separate. Give the pullets a wide, free range and coarser food, the single thought being to grow rugged, healthy bone, muscle and flesh; but confine the cockerels where they may be more liberally fed and pushed for the market. Don't allow them to grow together. The desire to make weight on one side will injure the possible value of the pullets on the other. Grow each for its special work. Don't wait for maturity before killing the males. Twenty-five cents at twelve weeks when weighing two lbs. is far better than twelve and a half at twenty weeks. Sell when the difference between price realized and cost of production is greatest, without

regard to age. Get as far as possible from the old idea that the heaviest weight at maturity must necessarily be the most profitable.

Times have changed and methods must change. Our fancies must go to the winds if they run counter to good business practices to-day. The standard of the present is the only one which can govern, in poultry breeding or in trade. Here is an inviting field for any young man who has brains to put into the business, one sure to yield substantial returns, and all the while give opportunity and furnish the stimulus for mental growth and activity. On these farms in these beautiful sections, with a sure home market which will increase each year, there is every inducement for going into the business on an extensive scale, and making a name and reaping a good harvest. All that is necessary is that the cost of production be carefully studied, and the product shipped be what the market calls for, and *just* what you represent it to be. A choice, fresh, attractive article will always sell, whether it is butter or eggs, broilers, roasters or chickens.

There is an open place for the best, and always will be, and the door is rapidly closing against the profitable production of anything else.

GRAFTON INSTITUTE.

F. W. Spalding of Poultney, said :

It gives me pleasure to meet so large an assembly of representative Vermont farmers here to-day. Such gatherings as these show a growing interest in the welfare of our calling. For the past 30 years there has been a steady decline in the price of our products, and it is now a difficult problem for some of our farmers to more than get a living from their farms. For the past half century there has been a regular exodus of many, if not of the majority, of our brightest young men, and they have taken many of the young ladies with them. They went to seek their fortunes in the then far distant West. The success that has crowned their labors you all know, for we are all proud of the achievements of Vermont's sons.

If you will give me your attention for a short time I will try to show you how the farm can be made more interesting for the boys

and girls, by giving them an interest, a part of the management of the same, and at the same time help the farmer to increase the size of his manure pile, and make a good addition to the profits of the farm. The man who has a village lot can supply his family with fresh eggs and poultry the year round, free of cost, and more than enough to pay all expenses. We need not be afraid of an over-production of fresh eggs. For the past few years we have imported poultry and eggs, mostly eggs, to the amount of $2,510,000 per annum. At the same time we exported to these same countries wheat, corn and oats.

I am not here to advocate the abandoning of all other lines of farming to engage in poultry raising, but I am here to show the importance, the necessity, of poultry on all well conducted farms, especially the dairy farm. It is a branch of live stock, the feed of which can nearly all be raised on the farm. Many of the bi-products of the dairy and farm can be utilized and turned into cash. Another advantage that we have is the market at our doors. There is always a market (and good prices paid) for fresh eggs in winter. All over the State are summer hotels and boarding houses that will take all our broilers, and surplus stock of old hens, and pay cash above the market price.

Poultry requires the most time and attention in the winter, when the farmer can best attend to it. Then the profits are the largest. I know a man that buys yearling hens and pullets in the fall, feeds them so as to secure the most eggs through the winter, and then sells them in the spring.

Travel through the State, and it will be hard to find a farm on which poultry in some form is not kept, yet on how many is it made the success that it should be ?

In speaking of poultry we will consider the hen first, not but what the other branches of poultry raising can be made profitable; but from the number engaged in the hen business, and the value of the products, and its ability to conform to all conditions, it takes the lead.

Many will say, "Oh, I cannot bother with the hens; they don't amount to anything." Let us look and see what they amount to in market. The statistics give the hotel and restaurant consumption at

$125,000,000 per annum. Manufacturers use $100,000,000. We are a nation of 70,000,000 people, 14,000,000 families, and should each family use only two dozen eggs a week, and $20.00 worth of poultry a year, we have $630,000,000. Not a bad showing for the old hen. In short, the value of the poultry product exceeds the value of any other single crop produced in this country.

Provide a suitable place for the hens. It need not be an expensive building, but warm, light and dry, with a southern exposure. Don't compel the hens to roost in trees or under sheds and then complain that they don't lay.

Give the care of the hens to some one member of the family, to one of the boys or girls, or any member that has a liking for them, and that will properly attend to them, for one of the secrets of success lies in *good care given regularly*. Let them have the profits from the sales, and let them pay for the feed consumed, etc., and when they have $5.00 don't borrow it and forget to pay it back.

I know a man that gave the hens to his boy. The man furnishes the feed that can be raised on the farm for the manure, and what eggs and poultry they use in the family; all other expenses are paid by the boy. In 1891 the profits were $1.50 a head, in 1892 they amounted to $2.25, and in addition a pen of thoroughbred fowls were added, in 1893 the profits were $4.00 a head. That boy is contented on the farm.

A friend of mine, a farmer, sold in one year from 80 hens $220 worth of eggs and $20.00 worth of poultry. Another man that lives in the village, and bought everything at retail, from a flock of 30 hens made a profit of $2.00 a piece, and I know others whose profits are from 200 to 400 and 500 per cent. on the capital invested. So you see the hens pay, and when you come to thoroughbred poultry the profits are much larger.

You frequently hear the inquiry what breed is the best to keep, or does it pay to keep pure bred poultry. It has been demonstrated at our Experiment Stations that the offspring from the union of thoroughbreds of two different breeds were, as a rule, better for the production of meat or eggs than either the parent breeds. But the crossing should go no further. This crossing makes it necessary that the breeding stock be kept pure, and this makes more of a

care than the average farmer wishes to assume. The best way is to select some of the standard varieties that are adapted to your wants, and then breed them pure. One of the profits to be derived from thoroughbred poultry is the pleasure of seeing a flock each the counterpart of another. In the many breeds representing nearly every conceivable color, shape and size, it seems that the most exacting could be pleased. Some one will say that the expense of pure bred poultry is so much that they cannot afford it. Then buy two or three sittings of eggs from some good reliable breeder, and this should give you good pullets enough for a pen for next year's breeding, and some good cockerels that some of your neighbors will want at a fair price, enough to pay for your eggs. But you ask what breed shall I select? The one that suits your fancy, giving due regard to the object in view. If for roasters, then select the Brahma, Cochin, Langshan, or Plymouth Rocks. If for broilers, Plymouth Rocks or Wyandottes. If eggs is the object sought, then select the Minorca or Leghorn, and should you intend to send your eggs to market, bear in mind that Boston wants a brown egg, while New York calls for a white egg.

At the present prices there is more profit in eggs than poultry, yet a pound of poultry can be grown as cheap as a pound of pork or beef, and the price is much higher.

Hatch your chickens early; there is more money in the early hatched chick than the late. March or the first of April is none too early for the Asiatic or American breeds, while a month later will do for the Mediterranean varieties. If you want to raise but a few, the old hen is the best, but if a large number is required, she must give way to the incubator and brooder.

I hire my eggs hatched in an incubator and raise the chickens under hens. I do this because it can be done cheaper than I can buy and operate an incubator. This would be a good investment for anyone who likes the business; buy an incubator, hatch your own chicks and then hatch for your neighbors.

Feed a little and often; give milk sweet at first and later on sour milk will do no harm; Johnny cake, oat meal, corn meal, stale bread, wheat and cracked corn as soon as they will eat it, and an occasional feed of fresh cut meat and bone.

Sell the cockerels as soon as they are large enough to the summer hotel. Keep the early pullets and keep them growing, and they should be ready to lay by Thanksgiving. Sell all hens over two years old in August and September to give place to the pullets. There should be enough realized from the sale of cockerels to pay for the rearing of them and the pullets. See that the chickens have plenty of fresh water at all times, especially in the hot days of summer.

What shall we feed our hens to make them lay? If you will watch a hen in summer you will find that in her wanderings she secures a great variety of food. In our long cold winters we should anticipate her wants and provide her with all the variety we can.

Feeding has much to do with any kind of stock raising, and we must feed for what we want to produce. It has been found that nitrogenous food gives the most food at the least expense; but one can feed too much nitrogenous food. There have been some valuable experiments made in this line at Cornell University, and let me quote from their report:

"During the first week the carbonaceous fed hens laid three eggs while the others laid two. The two groups were therefore practically evenly divided at the start as to the condition of the laying stage. At the end of the first period the nitrogenous fed hens had laid forty-three eggs and the carbonaceous fed hens had laid twenty. During the next twenty-five days the former laid thirty and the latter six; during the third period, the former laid six and the latter not any. From this time on, no eggs were received from either group. The decline in egg production was probably due in large part to the fact that the hens began to moult during the second period and continued to do so during the rest of the experiment.

"The eggs laid by the nitrogenous fed hens were of small size, having a disagreeable flavor and smell, watery albumen, and especially small, dark colored yolk, with a tender vitelline membrane which turned black after being kept several weeks; while the eggs of the carbonaceous fed hens were large, of fine flavor, of natural smell, large, normal albumen, an especially large, rich, yellow yolk, with strong vitelline membrane which was perfectly

preserved after being kept for weeks in the same brine with the other eggs.

"Samples of the eggs from each lot of fowls were privately marked and sold to a boarding house where the cook did not know that the eggs were undergoing a test. On meeting the cook several days later, she asked: "Do you expect me to cook such eggs as these! About every other one is spoiled."

"On examination of the ovaries after slaughtering, it was found that in the case of the carbonaceous fed hens, the ovules were in a more advanced stage, but on the whole the nitrogenous fed hens were much nearer the laying period, with this single exception, the cluster of ovules in the carbonaceous fed hens were uniformly small. Neither group would have laid under any probability for several weeks. It would seem from these facts, together with the fact that during the experiment the nitrogenous fed hens laid more than three times as many eggs, that a nitrogenous ration stimulates egg production." And I will also say, that the results of experiments conducted by Mr. Wheeler, at the Geneva Experiment Station, agree with this.

Most of us can feed small potatoes boiled and mashed, together with bran, for their morning feed. One of the secrets of a hen's laying in winter is to keep her busily at work. At noon give her a little grain, (oats, wheat, barley or buckwheat) scattered in the litter so she will have to scratch for every kernel she gets. At night give her a feed of corn or wheat, so she can go to roost with a full crop. Milk can be fed to the hens, and a handsome return received from it.

Hang up a head of cabbage and let the hens pick it, or throw in a few apples to supply biddy with green food. One of the best foods for eggs is from ground meat and bones, and with a few dollars invested in a bone and clover cutter, the cost of keeping our hens can be greatly reduced.

A short time ago I visited a farm on which several large flocks of hens were kept. Their feed was corn, ground meat and bone. The hens were laying finely and were in fine condition. Clover as a poultry food does not receive the attention it should. Hens often fail to provide shells for their eggs, especially if fed on

grain. Why is this? Simply because 100 grains of lime are needed for each egg to provide for the shell and bones of the chick, and as 1000 pounds of wheat or corn contain less than one pound of lime the hen cannot secure the lime. Just think; one must feed over a ton of wheat or corn to furnish the lime for 10 dozen eggs.

White clover contains 30 times as much lime as corn or wheat. Red clover 28 times as much. Clover will furnish all the lime, and as a flesh former is equal to corn pound for pound.

Mr. Francis A. Mortimer of Pennsylvania, who keeps 2000 pure bred hens and feeds scientifically, states that had he known of the clover hay food for hens 14 years ago he could have saved $1000, and since he began its use he finds fewer sick hens, more eggs are laid, the males are more vigorous and potent, and the eggs hatch better.

Unfortunately for us, also for the hen, she pulls her food from the plant. Give a hen a mess of uncut hay and she cannot eat it. She must have one end of the stock fastened, as she can not pick off the leaves if the stock yields to her efforts. She can go into the field and pull from the standing grass, but after it is cut she cannot eat it except at the risk of swallowing pieces several inches long, which may cause her to become crop bound, but if the hay is cut fine she can pick it up the same as she does corn or wheat.

Take this cut hay or clover, pour boiling water on it at night, cover up tight and let it steam till morning, and then mix in a little middlings or bran, and you have one of the best and cheapest of poultry foods.

Provide the hens with plenty of fresh water, and in winter have it warmed. See that they have fine gravel where they can have access to it at all times. Fix a dust box so that biddy can take a bath every day. There is nothing better for this than road dust, and it costs nothing except the gathering. Keep the roost and house free from lice; a little kerosene on the roosts will destroy the red mites that are so troublesome. Whitewash the hen house once or twice a year. Another great advantage that can be derived from the hens is the amount of valuable fertilizer that can be secured. This alone will much more than pay for the labour of caring for

them. Fifty hens should produce one ton of manure a year worth according to analysis about $12.25, while the expense of caring for them should not be more than $8.

In order that the manure be all saved, at the least expense, there should be a tight board platform under the roosts. Sprinkle a little land plaster on the platform to absorb all moisture, and clean it out often, once or twice a week, every day is better, pack in barrels or boxes and cover all with plaster, and you will have one of the best of fertilizers.

If there is any farmer here who has hens that do not pay, let him go home and make arrangements to hatch some early chickens next season. Keep them growing through the summer, and next winter give them the best of feed and care, and then report the result. If I am not mistaken he will be pleased with the experiment.

While we are caring for the hens do not forget the ducks and turkeys. Many parts of Vermont seem to be especially adapted to the turkey, and Vermont turkeys command the highest price in market.

For those that are located where they have a market for young ducks, there is no fowl that will make a greater growth for the first two or three months of its life, and give a better return for feed and labor than the duck.

Another branch of poultry that is especially adapted to Vermont farmers is the goose. There are many acres of land in Vermont that can be devoted to raising geese, with more profit than can be realized from it in any other way. In the first place, all the building needed for a flock of geese is a shed. The goose is a grazing animal, the same as a horse or cow, and will get its living at pasture. If attended to and picked, they will furnish nearly enough feathers to pay for the cost of keeping. Again, all the feed required for geese can be raised on the farm, and consists of three articles, viz: milk, corn meal and clover. The gosling I would feed milk, corn meal and clover. When a little older, I would feed clover, milk and corn meal, and to fatten, the feed should be corn, clover and milk.

The goslings need close attention, and should be housed from all

storms until the feathers on their back are well started, and then they will need but little care or feed, except what they will secure by grazing until cold weather.

Before I close I wish to say a word about marketing your product. In the first place grow for the home market. Get your regular customers, always give them good, and then charge them a good price. To illustrate, a friend of mine in Syracuse, N. Y., has his regular customers for eggs, etc. He puts his eggs in pasteboard boxes, a dozen in a box, and warrants every egg fresh. His customers are in all stations of life, from the chancellor of the University to the janitor of a block. One man, who has kept account of the family expenses for years, told him that since he had bought his eggs from him he had paid more a dozen, they had not bought as many, but the eggs were all good, so they had more eggs to use; it was cheaper and they were better pleased than by the old way of buying from the store. This is not confined to larger places, it is done in my own town. Our eggs are taken at the door. This applies equally as well to all products as it does to eggs, and is simply used as an illustration.

What I want every farmer here to do is to stop and think. It makes no difference whether he grows poultry or potatoes, makes butter or raises horses, sheep or hogs. Think for a purpose, see if there is not some place that we can improve our business. The time has come when we can not expect to raise the market price of our product, or try to compete with the West in quantity. We must think and study how we can cheapen the cost of production and improve the quality, and also increase the production.

In the past we have simply done as others did. The time has come when we must think and act for ourselves; never mind our neighbor, he must do the same.

Study how we can make our homes more attractive, how we can educate our children better, that they may be better prepared for the work before them, that they may be better citizens.

Teach them that farming is an honorable business. Teach them that Vermont is a good place to be born in, that Vermont is a good place to live in, and that Vermont is as good a place as any to die in.

# ROADS AND THEIR MANAGEMENT.

## BRAINTREE INSTITUTE.

Mr. Sanford—The people are awakening to a sense of their need of good roads. That our roads are in poor condition, and that the methods employed for maintaining and keeping them are also poor, I think all will admit; and it is for the purpose of agitation and discussion that better methods may follow, that we present this topic at a farmer's institute, and we would discuss it from a farmer's standpoint.

The value of farms depends largely upon road facilities. In buying or selling this factor of good roads goes a long way in the consideration that goes to set a price, and it is a question whether it would not be a good financial measure to build permanent and enduring roads through some of the rural sections, for the increased value it would give to real estate, to say nothing of the added comforts and conveniences in social as well as commercial life.

If we look for a cause of this awakening and dissatisfaction with present conditions, we shall find that it is not that our roads in a general way are growing worse, but that they do not improve. It is an age of improvement and invention, and we should not be satisfied to use the tools or appliances of a former age. The vehicles, harnesses and horses of former times have gone. Why use their roads? Why cling to these old mud roads, and methods of keeping that does not improve them? It is that other things have absorbed the attention of the people, and the subject of public highways has been neglected.

For the past fifty years the people of this country have given their attention to building railroads as a means of traffic and travel; scientific thought, engineering skill and the mechanics' art have been applied, absorbing the thoughts, capital and energies of the people, till we have a system of railroads in this country that

is one of the great marvels of the age. The amount of capital employed in their construction and management, as also the amount of business done by them in traffic and travel, is not easily comprehended.

During this time of railroad construction the highways, and a system for maintaining them, have been neglected. Whatever legislation there has been upon the subject has been simply to remove present friction, or to adjust to present emergencies, no advancement having been made in methods of road building, either scientific or by mechanical skill. People have awakened to a realizing sense of the situation, and find they are using roads poorly adapted to their needs, and that the means employed for maintaining them are most extravagant, and this subject is before every legislator in the land.

The agitation has brought up the subject of permanent, scientifically constructed roads, which is receiving the attention it deserves, and it is a hopeful sign of the times that road building is to be taught in some of the colleges and Universities, and the building of such roads has already begun in the large towns and cities. Doubtless this is more economical in the end, for these roads are to be used as long as civilization lasts, and when they are once built very little outlay is required to keep them, and it is better business management to use the money in the construction, than to expend it yearly in repairs on a road that is never satisfactory.

We have pretended to build these roads every year, and yet they have never been built. To construct anything else of equal importance to us, we consult the scientific engineer as well as the mechanic, while in this matter we have only considered the labor element, which in fact is of least importance, unless well directed by intelligent thought.

And so it seems reasonable to believe that in the course of time there will be built in this country a system of permanently constructed highways. But mistakes will be made, and it will be some time before we have definite knowledge as to principles and methods in scientific building, or right legislative action.

State roads—there is another question that needs solution. To what extent shall the State build and maintain the roads? Our

State has taken one small step in that direction by appropriating a tax of five per cent. for general road maintenance. This I believe to be a step in the right direction, for it goes to help the rural towns. Some may think it wrong to take money from the large towns and cities, after they have built and maintained their own roads, and give it to the smaller or rural towns to be expended on their roads. But I think there is a principle of right in it. The rural towns have contributed in large measure to the property and wealth of these cities and towns. The farm, the forest, and the mine have each and all contributed a liberal share, and the farmer in the disposition of his products as well as in what he has to buy, and in all professional services required, in insurance, and in nearly all he does, is constantly paying tribute to the superior town, and besides the rural sections are constantly giving to the towns and cities their jewels in the best men and women. Yes, it is just and right that the cities and large towns do something to help maintain and support the roads, schools, and churches as well, in those sections which are the nurseries from which they derive much of their wealth, and also their best men and women.

This is a new feature in our road management, and the towns receiving a revenue from this source should see well to it that this money is well used and improvement made, for upon this will depend future legislative action upon this subject. Should the money derived from this source be expended under poor management, with little or no improvement to highways, there will be little encouragement to continue this policy; and for this reason it seems advisable, at this time, to strike out into new lines, and adopt such methods as will accord with the spirit of the times, and result in improved roads.

With benefits resulting from this policy it is reasonable to expect a continuance of State aid and perhaps State management, to what extent it is difficult now to predict.

Now while there is only the pleasing prospect of permanent highways in the future, and quite remote at that, for they will come to the cities and large towns first, and State management also in the dim future, there is the question to be settled,—how to maintain and improve the roads we have.

That the people have been easy-going in this matter, careless in methods and extravagant in results, I think all will agree.

The new road law of 1892 seems to be a step forward in the line of improved methods. Concentrating the authority in one man as road commissioner is an advantage, in that there is no shirking of responsibility upon another, and it admits of a good working system for each town, under the direction of one man, and if he is well chosen, a man of good business capabilities, there is reason to hope for, and expect, better management.

Old methods are too expensive and extravagant for these times, and should be abandoned. No method could be more extravagant than the old custom of going over the roads once a year in the middle of the summer, pretending to build them, or repairing the damage that was caused simply by neglect—sheer neglect, nothing else. Why is it that the roads are *out* of order ? They don't wear out. There is not travel enough on the country roads to wear them out in a hundred years. Of course there are exceptions to this statement, but in a general way they do not wear out. They go to waste by water in almost every instance, and by neglect. These roads are wanted for use every day, and will be needed next year. Then why not keep them ? Why let them run down when they are wanted for continual use ?

Something can be learned here from the management of the railroads. If the companies failed or neglected to give constant care and attention to their roads, to keep them in repair and in good serviceable condition, they would soon be bankrupt. If the railroads were neglected as the highways are, and looked after and repaired occasionally, or yearly, accidents would be so common they could not long be used, and so it is good business management to keep the roads, of whatever kind, in good condition continually.

In too many instances, the road commissioner makes the attempt to fix all the roads in town personally ; that is, with a gang of men he goes over all the town, repairing the damaged roads.

This is a custom that has come down from old pathmaster times, and should be forsaken for something better. It takes too much time in repairing broken or damaged roads,for all such work should be done at the earliest possible day after the ground is bare

of snow, or while the ground is soft; and while the gang are in one section of the town they are needed in another, and so it is generally unsatisfactory. And besides, this general run-down condition of the roads, all needing mending at once, never ought to be. We want to stop a good deal of this working on the road, do less, and do it at the right time. It is a better way, and within the spirit of the road law, for the commissioner to lay out the roads of his town into sections, selecting good, trusty men living on the various lines, one man to each section, to care for and hold these roads. The commissioner should enthuse each section man with his own spirit and determination that these roads shall not go to waste; each man should be instructed to see and go over his section as soon as bare ground appears and water begins to run in spring, clearing the culverts, sluices and water courses, removing obstructions from the ditches, and in all ways keeping the water from the road, going over his section as often as occasion requires, to keep it, hold it and save it. He should be provided with a good, long-handled round-pointed shovel, and while the ground is soft in spring he will make needed improvements by filling slight depressions, etc., charging a good price for each hour's work, in a pass book furnished for the purpose. As his farm lies upon or is situated near this road, he has a personal interest, and a pride in its good condition.

All over town, this work goes on just at the needed time in early spring, and through the year as necessity demands, and in this way the roads are kept at small expense, and under this management will gradually improve. In most towns there is one main road that receives most of the travel, and is much worn. In our town this road is six miles long, and is given to one man, who, with horse and dump-cart, works it in sections. Beginning Monday morning at one end, he works about one mile each day, going over the entire road each week from early spring till late fall. The road is kept free from stones, slight depressions are filled with gravel, and all kept in good condition at much less expense than under our former practice of working or repairing it by spasms, and using an unsatisfactory road most of the time.

There are some things connected with the old system of man-

agement that cling to us with great tenacity; the practice of going over all the roads once a year and doing a lot of work by plow and scraper; hauling up from the ditches onto the road-bed the worn out material to make dust or mud is another thing, and another is the custom of men who depend upon working on the road with the main purpose of paying their taxes. This is a relic of the old highway district system, when men worked out their highway taxes without discrimination, the young and middle-aged, sound and strong, together with the old, feeble and infirm, all receiving the same pay for a day's work. Good business management is what is needed in this matter, and it is only attained by having for road commissioner a man of good business ability. To select a man for this position simply because he is well equipped with teams and tools, or because he is a good worker, or a good foreman of a gang, is not in the line of good management. First of all, sound business principles should be applied, that the people's money that is expended for public highways shall be expended with good judgment, without waste, and to give the best possible road facilities for the cost.

This can best be accomplished by some such method as I have indicated, every section of road under the constant care of some one who will have an interest and a responsibility in preserving it from waste, and with slight work at the right time, making a gradual improvement in its condition. This will give better roads at less cost, leaving a portion of the usual appropriation for permanent improvement; and here is the danger that some towns will appropriate only the minimum sum, without any attempt to permanently improve their highways.

This will not be making progress except in saving expense, and will not be in accord with the spirit of the times that is demanding better roads. The money derived from the State tax, together with a portion of the usual appropriation, should be set apart for permanent improvement each year. Selecting a section of road for this purpose, it should be well studied, and examined in relation to the surface, nature of the soil, sub-soil, want of drainage, amount of travel, etc. Many things come into the account, and perhaps there is nothing more important than drainage. It is well known that

water is the greatest enemy, or hindrance to good roads, and if this can be excluded or got rid of, most any of our materials, even clay, will make a good road. Gravel, or clay and gravel combined, makes an excellent road when free from water, but when mixed with water it is a failure.

In the rainy season in autumn, if the road bed is flat, or if there are ruts or depressions holding the water, or if there are pools of water in the ditches, or by the road side, it permeates the ground, till the road bed to a considerable depth is perfectly saturated or filled with water, making a soft, muddy road till freezing time, when there is a rough, frozen surface for a time. But the greatest trouble is in the spring time when we say the "frost is coming out of the ground." This water, when frozen, is expanded in every direction, separating every atom of dirt or sand from every other atom, and when the ice is melted, there remains this loose condition of the ground or road material, with only water between and separating the particles of earth, giving conditions that make the road unfit for use; and so we see it is the water that makes the mischief, and of whatever material the road is built the water must be excluded or the work is a failure; hence good drainage should be the first consideration. And so this section of road that has been selected for improvement should be well studied, and when it is determined what to do in view of permanence and durability, why not proceed as is done in other work of like importance, and employ experts in their line of work, or let the job by contract.

A few years' practice of some such plan as is here outlined, and taxes would diminish, for the expense of holding or keeping roads that are well built will be trifling compared to present conditions. It is probable that one of the greatest burdens with which the farmer has to contend, is the poor condition of the country roads, and the expensive methods of maintaining them. This is seen in the fact that farms remote from market towns, having good, arable and fertile land, good water, beautiful scenery, and everything that goes to make a pleasant home with good surroundings, are of comparatively little value, simply and only for the want of good highway facilities. And so it is that one of the greatest factors in sustaining and improving the rural towns is good roads, well managed.

Mr. Winslow—Are snow-rollers used in this section of the State, and what is the feeling in regard to them ?

Mr. Wells—We use them. We have three in Randolph which we run after every heavy snow, and it is the only way—the best way to break the roads. They are heavier and larger than they used to be.

Mr. Sanford—How heavy a team do you use ?

Mr. Wells—Six horses.

Mr. Winslow—How large are the rollers ?

Mr. Wells—Five feet in diameter, and thirteen feet long. I think a smaller one that four horses could pull would be better.

Mr. Sanford—In some sections in which they are used they say that in the spring the roads work badly. How do they work in the spring ?

Mr. Wells—I don't agree with them in that respect ; the roads will cut down gradually and leave a solid, even road; but where they are not rolled, they will cut through the first time ; if rolled they will be solid all the way through and melt away gradually. The result is a good road all the time.

Mr. Sanford—How about slumping ?

Mr. Wells—There is no slumping. I went up through Brookfield when the snow was all off here in the valley, and I could go right along with my wagon, having no trouble at all.

Mr. Winslow—Is it any assistance in keeping the roads level for log teams ?

Mr. Wells—They don't cut down as when the roads are not rolled.

Mr. Winslow—How about holes ?

Mr. Wells—We don't have them.

Remark—I have been trying to get our town to introduce a roller. We spend a good deal of time in trying to get men to cut them down.

Mr. Wells—If you have a road smooth in the fall of the year. you won't have pitch holes, and it is the same with slewing off ; if the roads are smooth when snow comes, you won't be troubled with slewing. Over in Hardwick they introduced the roller before we did here, and I went to the board of selectmen and got them to introduce the roller. Now, not a man is dissatisfied. When

we have a snow, they say, "Why don't you start the roller?" Sometimes they put on eight horses, but I have not used more than six.

Mr. Sanford—As you have observed the situation, what is the sentiment of the people in regard to the new law?

Mr. Wells—I think it is well liked. When I was elected, they said I would be kicked all over town. Every man had something to offer, but I thought, as you said, that one should have proper machinery; and I got the roads all fixed up before haying. This idea of fixing our roads up in September and October, I don't believe in. The sooner you can work a road in the spring, the better your roads will be—the same as in cultivating land. If you get on to the land before the water is out of it, you will have a hard field. I don't care if you work in the mud. I have worked when the team was in the mud all over, going over and smoothing it off a little when the road was more dry, but any rain we had this summer had no effect upon them.

Mr. Sanford—There is a point that can't be emphasized too much. I think it is a mistake to work the roads in September. Earth will never be compact until it has had rains; and I believe the time to do this work is in the early summer. They should be looked after constantly. When the roads are once repaired, look them over often and keep them there. A man will take care of a large piece of road in a day. The cheapest way, in my opinion, is to keep a man on the road every day.

Mr. Winslow—I would like to ask Mr. Wells how he builds a road on a hill—if he puts in water bars?

Mr. Wells—I don't put in water bars. I have only one hill in town that has them. If you want your back broken, make bars. I can build three miles of road in May easier than I can two miles in June, when the grass gets high, and the sod has become harder, and less easy to work. When the sods get hard you can't level them down so you can smooth them that year.

Mr. Winslow—I would like to ask Mr. Gabrilson about the roads in Iowa.

Mr. Gabrilson—I am very much interested in this discussion, because we are meeting this same difficulty that you are hearing of

here. It has been talked of making stone roads in Iowa. We have only earth to make the roads of, for we have no stone. For ten months in the year we have the best roads in the world, and for two months very poor roads. The worst possible roads to be found are in the United States, as a general thing, and the best possible to be made are in France. We have discovered that the enemy to a good road is water—the same enemy you have here. We in Iowa are using tile, and six or eight inch tile will carry off all the water, so that there is no water left in the soil. It seems a little odd that you, here, are discussing the question the same as we are in Iowa, for right here beside the road you have the means of making the best of roads—you have plenty of stone right at hand. We have talked of making our roads of fire brick, but this would cost us at the rate of two dollars a square yard. One hundred and sixty rods past a man's farm, is more than the farm is worth. If we only had your rocks, we should have just what we need for our roads. When they use stone, they usually use the stone crusher. I suppose you have gravel here, and use that to some extent. The worst thing we have to contend with, is to get the water out of the soil.

Mr. Wells—I agree with Mr. Gabrilson. There is a piece of road from the Adams Creamery to Randolph, where I built up the road. It was in a terrible condition. I drew stone half a mile and put in there, after putting tile in first. I pounded the rock up with sledges, and then covered it up with earth. It has given us no trouble since. I also fixed a piece of road near West Randolph, which is like your western roads. I put in stone and tile, and have had a good road ever since.

Mr. Gabrilson—I would like to ask if stone crushers have been used ?

Mr. Wells—Not much. Burlington and Montpelier have each one. I believe we will have one another year. It is the way to make roads—using crushed stone.

Mr. Gabrilson—Have you a gravel pit ?

Mr. Wells—We have one, but I think the stone crushers are better.

Mr. Sanford—I have great faith that the best roads in the State

are to be made out of stone. Brattleboro, Bellows Falls, Rutland, Shelburne and Burlington all have the stone crusher. Col. Hooker, who is at the head of the matter in Brattleboro, induced the selectmen to try it, and the town is pretty well satisfied that they are going to build their roads of stone without any extra expense. How? By adopting some plan as I have outlined to you. Last year they built some, and this year more. Brattleboro is not increasing her tax, and they have beautiful roads. These towns are going to reach out their roads and touch each other. I believe it is just as sure to come as the sun is to rise, but the question is, when will the time come?

Mr. Williams—Will you tell us what kind of rollers you use? The point I want to get at is this, can these *rollers* be used on the hills?

Mr. Wells—We use them on our roads in Randolph, which are hilly.

Mr. Sanford—What do you do on drifted roads?

Mr. Wells—We keep on top of the drifts. We don't cut them down. The higher you keep the roads, the less they will drift the next day. That is the advantage of building the roads high.

Mr. Packard—I would like to ask Mr. Wells if he has tax enough to run the roller in the winter?

Mr. Wells—What is necessary.

Mr. Packard—I believe you have some $3,000, while we only have $1,100 for our roads. I agree that where these rollers are used, the roads cut down gradually as the snow goes off, but we have good roads that you can't run that roller on. Then we have roads that have been fixed so that teams can pass, and then the old style of road fixing has been followed, in many places the roads being just one ditch. I have four mountain roads to care for which run from a mile and a half to four miles in length, and run back into the mountain. That road last spring, when I took it under my control, was in fearful shape. It had been passed over with a hoe and bar, and that was about the extent of the work done on it, and last spring it was not safe for a team to pass over. The soil is blue clay. I took that road the first thing in the spring, and it was just mud and water. But when you talk about stone roads,

we have got them right here in Vermont, and in this town—nothing but solid rock. You can't cut into them, and the soil is sand and lime, with very little gravel. With my tax, what I have, the way the roads have been left, I have not much left this winter to use a roller. Seven years ago I was put in as one of three road commissioners, and when we were through some fault was found because we had expended too much money; although there is not a bridge which I did not take up this year, and I have put in over two hundred small culverts.

Mr. Gabrilson—From the fact that your roads have regular attention, it seems to me that the stone crusher is going to be the best and most economical way to make the roads. I don't think it is best to advocate the building of roads by the general government, or by the State even.

Mr. Sanford—Using a stone crusher, are the rocks found here the right kind of which to make a good road ?

Mr. Spear—We have almost every kind here.

Mr. Wells—Stones right out of the brooks are the best for the roads. We have some roads which are too narrow for using the roller. Williamstown, however, is the banner town in this direction. They use the roller, and you can't go past a house after a heavy snow but that you will see someone out with a private roller keeping the road in good shape. They don't wait for the big roller to come along.

Mr. Packard—I don't object to roads being rolled, but it would take as many teams to run a roller over our roads as to run a road machine. We have some back farms, and the expense of keeping the roads open for these farms is greater than keeping the summer roads.

Mr. Sanford—It is so this winter.

Mr. Packard—It has been so in past seasons more than half the time.

Mr. Sanford—How is it in Randolph ?

Mr. Wells—For the last two years it has cost between two and three hundred dollars to keep the roads open. I keep back about three hundred dollars for breaking the roads.

Mr. Spear—This matter of breaking the roads is uncertain—some

years the expense is almost nothing, and another year it is very great.

Mr. Wells—In Brookfield it cost between eight and nine hundred dollars to keep the roads broken out.

Mr. Carpenter—In regard to keeping the roads open, I would say that we had a severe blizzard last March, and the roads drifted very badly; still we used the roller to advantage. Having adopted the roller system of keeping the roads, we think that it takes no more teams to keep the roads in good shape than the old method did, and ordinarily we save expense. We keep on top of the drifts, using one roller that weighs 900 pounds, and which is run over about twelve miles of road. It was built especially for keeping the stage road to Randolph in good repair. It needs six horses, but ordinarily we have not used over four. We can't draw it except in places where the snow is comparatively level, and where we come to a drift that is six feet deep on one side and shallow on the other, we shovel it down until it is level. Last winter our road was raised four feet by the snow, and this road never slumped or let anybody down, gradually coming down to the ground in good shape. All of our roads are rolled. We hire someone who lives on high ground, and can come down all right with a good return road. It is not so much work as to draw the roller up hill through the soft snow in the first place. One year with another, our winter roads cost us as much as our summer roads.

GEORGIA INSTITUTE.

Mr. Towle—Water is the great enemy of good roads, and there is great loss by allowing it to stand in the middle of the road and soak through and undermine the road. There should be some man responsible for every section of the road, with instructions to turn the water out of the road and away from it as soon as possible. If a stream of water gets started in the road it does not take long to wash away the work of days at an outlay of a good deal of money, when an hour or two of work by one man, at a cost of twenty-five cents would save as many dollars.

Mr. Buck—When the surface of a road is worn out could you not remove the mud and dirt better with a road machine than with shovels?

Mr. Sanford—They are sometimes used to scrape the dirt and mud into a more convenient shape to shovel into wagons, but the usual way a road machine is used is to round up and form the road bed into a proper shape.

Mr. Loomis—How long will macadam last on clay ?

Mr. Sanford—That depends largely on how well a road is built in the first place. A good road, thoroughly built, will last a great many years, with a little repair on the top as it becomes worn in holes.

Mr. Curtis—When roads are passably good it is better to patch, and take the surplus money to build permanent roads.

Mr. Buck—Is slate good material for roads ?

Mr. Towle—Lake shore slate makes good material for a road.

Mr. Buck—Has anyone had experience with gravel on clay ?

Mr. Cilley—Coarse, sharp gravel makes a substantial stone for road-beds.

Mr. Winslow—Gravel makes a good road on any soil that admits of its being pushed into the ground by travel, as it makes a hard road-bed, and lasting.

Mr. Walker—I believe in keeping a road in repair. Build a good road to start with, and then keep it up, by a small outlay just as soon as it is needed.

WEST CONCORD INSTITUTE.

Mr. Cheney—In order to get good roads, we should take care of what we now have, and build a section each year of good permanent road. In this way we would not feel the burden, and in a few years our worst main roads would be our best ones.

Mr. Chase—It is easier to take care of a good road than a poor one. The trouble with our roads is that we never build a road good enough to have it last and removed from annual expense. I believe if we would take a short piece of road and build it so it would last several years, there would in a few years be a decided improvement, and no increased expense in the long run.

# SHEEP.

## SHROPSHIRE SHEEP—THEIR CLAIMS TO PUBLIC FAVOR.

### BRAINTREE INSTITUTE.

Mr. Guy A. Clough—It has been said of sheep that they are the most valuable of all the animals that contribute to the wants of man, and are closely associated with his history, vicissitudes and progress from the earliest time. The origin of sheep is unknown ; it may be traced back through vast ages into the mist of time's dark obscurity, and probably before the advent of the human race upon earth, for we find it associated with the son of the first created man—"Abel was a keeper of Sheep." Search the Scriptures, and how closely we find it associated with the material and spiritual welfare of man, adopted as a symbol of purity in Christian belief, an emblem of patience, docility and forbearance. A careful observer, who would calmly survey the vast world of animated nature, would note the teeming millions of sheep, which contribute so much to the wants and comfort of mankind. The thoughtful mind wanders from the scene around him when contemplating this useful animal, how it has been developed and adapted to conditions opposite and extreme ; be it upon the high, bare, desolate mountain, or the scorched plain of Africa, sheep are found suitable to the conditions or soil, climate and man's requirements.

Modern civilization has not rendered sheep less important now than they were at earlier periods ; they form the most essential of all food, and their wool is one of the most important materials connected with trading, manufacturing and pastoral industries of mankind. If this applies with more force to any one breed of sheep than another, I think it is the Shropshire.

To realize the largest margin of profit should be the aim of every keeper of sheep. There are several breeds that are valuable for mutton and wool, and, owing to the fact that different classes of wool are

required to manufacture different sorts of fabrics, it will be necessary to continue to breed the various kinds of sheep. What would seem to me the strongest claim which any breeds of sheep can make for public favor, would be their ability to return the largest possible value in mutton and wool, for a given amount of food consumed. The question is not what a single fleece of wool or carcass of mutton will bring in the market, but rather how much is realized per acre when the product is fed to sheep.

### HISTORY OF THE SHROPSHIRE SHEEP.

The Shropshire sheep has descended from a breed which has long been known to exist in different parts of England. Anderson, in his Origin of Commerce, in giving the comparative prices for different grades of wool as early as 1343, quotes Shropshire wool as the highest for exportation. In 1792 the Bristol Wool Society gave a report on the Morfe Common breed of sheep, which is the original stock from whence has sprung the present breed of Shropshire sheep. In this report they state that on Morfe Common near Bridgenorth there were about 10,000 sheep kept during the summer months, which produced wool of a superior quality. They were black faced, or brown, or spotted, but little subject to either foot rot or scab. The term "Morfe Common" has reference to a tract of common, or public land, unenclosed.

Although some writers state that the Southdown was used in the first attempt at improvement of the breed, and to effect the removal of the horns, many men, equally well qualified to give an opinion, adhere to the statement that the uniformity of character, and the perfection of form, are the result of selection from the best types of their own species. No doubt some breeders, many years ago, had recourse to the Southdown or some other short-wooled sires, but the result was most unsatisfactory, and nearly ruined the flocks of those who made the trial. It is an established fact that no one has ever achieved any success, reputation or acknowledgment as a Shropshire breeder, who has deviated from a line of pure breeding, since Shropshire was first recognized as a distinct breed at the show yard of the Royal Agricultural Society of England in 1853. From this time on they grew rapidly in popularity, until 1884 when they reach-

ed the goal of success at the great Royal Show, there being 875 entries in the Shropshire department, against 420 of all other breeds combined. Their success, however, did not stop here, but through inherent merit they have pushed their way to the front in rapid strides, until they are the most popular breed of sheep upon the face of the earth. They are not confined to any one country, or climate, but are becoming the leading sheep in every sheep-producing country in the world. Large numbers of them are yearly exported from England to all parts of the world, the larger part of them going to South America, Australia, Germany, France, Canada, Greece and the many English colonies, and most of the other continental countries of the globe. Vast numbers are imported to the United States every year. It is something for the breeders of Shropshire to be proud of, that one of the breed should be champion over all competitors, as best sheep of any breed at the World's Fair at Chicago in 1893.

The Shropshire is one of the best to cross upon our common sheep, as will be seen by the following taken from the Breeders' Gazette of Nov. 27th, 1889, concerning the awards at the great fat stock show in Chicago, in the sheep department:

"The slaughter test here, as usual, was disappointing to many, while replete with lessons to all. Notwithstanding past experience it is still apparent that the average estimate of value of live sheep, even when determined by 'expert' judges, cannot be relied on to find vindication in the dressed carcasses. This was quite forcibly emphasized when both the fine-turned yearling Shropshire wether, securing the grand sweepstakes ribbon in the live ring and the two-year-old Oxford that was his close competitor for that honor, failed to secure recognition in the block test. Here all the representatives of the so-called mutton types—Leicester, Shropshire, Oxford and Southdown—lowered their colors to an animal of one-half Merino blood, the produce from a Shropshire ram on a Merino ewe. The same carcass secured the prize in the two-year-old ring for crosses. The prize for lamb's carcass went to a Shropshire."

That there is a great future for the Shropshire sheep there is no doubt. They thrive and become acclimated in any climate when

properly cared for, and as they meet all the requirements of the present day they are a successful general purpose sheep, and therefore very profitable for farmers and breeders to grow.

## RAPE.

This is one of the best crops, I think, for lambs in the fall, of any crop to be raised. It is easily grown upon any land that will grow turnips. A well grown crop of rape will carry from 12 to 15 lambs per acre, from Sept. 15th till the snow covers it up.

The time of sowing may be any time from about the 15th to the 20th of June, until the middle of July. The drills should be from 24 to 30 inches apart; the latter is preferable if the land is very rich and likely to produce a heavy growth. The amount of seed if fresh and good should not be more than 1½ pounds per acre; it is a great mistake to grow thick. The lambs should not be turned on until it is from 15 to 20 inches high. Care should be taken when first turning on as it may cause some trouble, but leave them on only for a short time at first.

# THE OUTLOOK FOR SHEEP BREEDING.

## EAST BETHEL INSTITUTE.

V. I. Spear—There have probably been many times in the course of the past ten or fifteen years when people would have gathered with more enthusiasm, and looked upon the sheep industry with more interest, than to-day, but I don't think there is any branch of farming in Vermont that we have been brought up to, which we can afford to set aside. From time to time discouragements come to any line of work. So sheep husbandry is looked upon now with distrust. It is not my purpose to enter into discussion as to what has brought it about, because we might not agree as to the causes. It would be largely a matter of speculation in which each one would entertain opinions they would not wish to change. We must consider the facts as we find them, and consider sheep husbandry from the economical side, rather than from the political side. It is on that line that I propose to talk.

This is not the first time that sheep have been low within the history of the country, or within my recollection. Cows are now continually going up. What depresses one industry puts another upon the forward path. Perhaps I have had more cause to regret this depression than others, for this has been my line of work. The price of Merino sheep has fluctuated more than that of any other industry. We can look back to the introduction of the animal in this country from Spain, and try to reason and encourage the people.

Before 1820 we find that these animals were first introduced and sold here for prices that were phenomenal—a thousand dollars a piece—and a year or two afterwards would sell for only a dollar. The blood was all the value there was in them, and the demand for blood had ceased. An instance has been told of a man who was going to make his fortune in sheep, and put all his money into one sheep. Just then came a turn in the tide and the sheep

industry went down. Nobody wanted that sheep. Nobody had any use for that kind of an animal. He had got to do something with it, and the only thing he could think of was to bring his sheep business to a close. So he made a dinner and had the sheep dressed and cooked. At dinner he made a little speech, and said he had put his whole fortune into that sheep, and he wanted them to enjoy it. Just so, there are a great many people that have had experience such as this. They have seen themselves the possessors of great fortunes in an animal they have had on their farms, but by a little slip of the market have lost all. We don't need to go out of Vermont to find people who have suffered in this way. I say we are justified in keeping our heads cool, and looking at the present condition of sheep husbandry as not much worse than it was in the past. It is true that the wool industry is lower than ever in the past. On the other hand mutton has been very much lower than it is to-day. In fact, it bears up well in price, in comparison with the price of beef, and, but for the rush to get rid of sheep, the value of the meat of the flock to-day would not be lower than it has been in years past. Now in the present condition of our country and the markets, the average farmer is demanding a little different sheep from that of a few years ago. Surroundings are changed; conditions are different; and we are obliged to produce what the markets call for if we are going to get any return for our labor, and if we are raising a class of sheep for market we should look around and see where we can get the best price. There has been a tendency in the market to appreciate the value of mutton as a food product. Forty years ago, hardly anyone supposed it was good for anything to eat, or that it was decent to eat the flesh of sheep. It was hardly expected that mutton would be an article of consumption as a meat food. Well, we see a change has come over us—so much so that the best hotels and houses never fail to have mutton on their bill of fare, and a large proportion of the travelling people call for it. There has come upon other productions a suspicion. There has come upon the hog product a suspicion of hog cholera. There is prevalent over the State a fear of the disease of cattle—but of the mutton product we have no occasion to fear. Then again, we have learned that there is a differ-

ence between good and poor mutton. We have found that it is possible to breed a sheep and raise it in a way so that it is as choice as any meat that can be set before us: and the improved quality we are producing has gone very far towards increasing this demand; and in light of this demand, and in view of our nearness to the markets of this whole country, it seems to me that we have in this product something that is well worth cultivating. We can cater to the taste of the people. We can cite instances of how profitable this is to the country. I was looking over yesterday some reports of the breeders of early mutton lambs, and found that they had figured out as worth $15.00 a head, lambs when only a few weeks old. It might be profitable to raise these early lambs, and it might not, here, but I believe it is a profitable industry on most of our farms. We shall find that it is profitable if certain conditions be carried out properly, and that it will average up with any line of farm industry. I can remember back a few years when we could only get ten cents a pound for butter sent to the Boston market. Dairying was under a sort of cloud. Since that time there has been a change, and there is a demand for butter products that surprise those who produce it. What the change may be within the next five years, it is entirely impossible for any of us to anticipate with any degree of accuracy. I have faith that any product which the market of the world is calling for, will, in any number of years, averaged, bring a good price. If the people of this country prefer to eat mutton for food, then somebody is going to get a good price for producing it. Enough people will abandon any line of work, so that those who remain in it can get good prices. That is my idea of the sheep industry of Vermont to-day.

I believe it is for our interest to preserve some of the flocks of sheep on the farms of Vermont. There is nothing on our farms that requires so little attention as our sheep. They are adapted to making use of foods that are of little value to other animals, and to making also more economical use of these foods as well. They are of an advantage to us, also, from the fact that it costs us practically nothing to run this industry through the summer months. There are but few farms that have not pastures too far removed to keep cows, and which must be left to grow up to bushes. Many

of these pastures have some of the richest feed that Vermont possesses, and are adapted to carrying the sheep through the summer months at a very little cost, except for making a few fences and keeping the sheep salted. They are desirable from the fact that it is advisable for a man to have more than one kind of stock on the farm. I am aware that I hold different views from some of my associates in the State on this point, but still I believe that it is desirable to have more than one kind of business on the farm. Some people may be adapted to putting their whole force into dairying, but there are few people who are so thoroughly imbued with the idea of dairying that they can't give attention to some other business, and make it more profitable by having some other work in connection. I don't believe a few sheep running in a cow pasture do any hurt. Sheep and cows do not gather the same kind of food. If you have many cows, I don't believe in keeping them in the same pasture constantly—change them from one pasture to another. I think the pastures under dairying are growing poorer. Since taking all the feed from the pastures and putting it on the meadows, we have poorer pastures. I think the sheep help to build them up, and keep them in better condition than the dairy herd alone. I believe that the successful sheep man, and the successful dairyman, stand upon pretty equal ground.

Dairying is not always practical. I have found that we have a good many towns in Vermont which make only about 100 pounds to the cow. In one town there is made over 250 pounds to the cow. Between these extremes there are all grades of success. People that are making only a hundred pounds to a cow are running behind, and if it be necessary to run behind in one of these branches, I should prefer to run behind in sheep raising, because there is not so much work to be put into it.

Selecting stock should be done according to each one's individual preference. Some people will not succeed as dairymen because they hate cows. One of our prominent statesmen said that he would go several miles out of his way to kick a sheep. Well, that man ought not to have sheep. Another man likes a horse. Now the man who likes sheep and keeps them, does so because they are adapted to his use, and he will study this question out on some line

that will give him a fair competence for his labor. I know plenty of men who have been making fair success with sheep year after year, and are doing it now. For the past twenty years they have made a living out of it. That same man might be a hundred pound dairyman if he went into it, for he might not care for it. The man who will get 300 pounds to the cow, might be the man who would not get more than a dollar for his sheep per year. A man must study into the line of work for which he is best adapted. The income from a sheep may be made to vary from three to five dollars a year for the lambs that are sold under various conditions. The raising of early lambs has been in Vermont a leading industry, and I am inclined to think the man who is going to have some fine lambs on the market next July will make a good thing of it. The mutton product is a ruling element that is not a caprice of any special time, like the wool product. Here in Vermont we are particularly adapted to the sheep industry, as the records of the past will show. We find that they have thrived, and attained the greatest perfection ever attained. We find that the Spanish Merino had to come to Vermont to get that perfection that has given them a place in the markets of the world. Everywhere throughout the world, where this sheep has gone, it has set forth the characteristics of the Vermont Merino sheep. In Australia, and in South America, this type has been taken as the model. We find that the German bred sheep are valued for their size, but when we get down to the raising of wool we come to the Vermont Merino. This breed has more wool on the carcass than any other sheep in the world. Trying to breed this sheep for wool and mutton both has not been successful. The Australians tell us they make a mutton out of the merinos, but with our own experience we have never been able to do this. Trying to find a mutton and wool merino, is like trying to find a horse that will trot fast and will draw a large load. There is do doubt that you can breed a merino sheep that will make fair mutton, but what you gain in one direction you lose in another. So I believe we should keep the type pretty near as nature has made it. For raising a mutton sheep we should not breed for wool and mutton both. There is a certain

standard and purpose along the line of stock breeding that we need to understand and adopt.

Now there is a little something I would say about caring for sheep. The most critical time in caring for sheep, I have found to be through the fall months. We have very little trouble after they go into the pastures in May, until we take them home. About the first of October we have to give particular care to those sheep that we want to winter in good shape. After the feeds have been touched by the frosts, they lack an element of vitality. They will eat enough, but it does n't seem to do them any good. Here is the time when it will pay to give grain more than any other time in the year. You remember the old saying that a "sheep well summered is half wintered." Don't let them fall away. It is a great deal easier to keep them up in good condition when we once have them there. When they go to the barn in good condition, the sheep do not need very much grain. If a person has a little grain to spare, give them some, but if not, feed silage—something in the line of succulent food. They should have succulent food whether they have grain or not. For many years I have fed turnips, and more lately I have experimented with other feeds. I have found that it was a good deal of work to raise turnips, cut them up and carry them out, and so I have been trying other feeds. At the present time I am feeding corn silage. I have also fed apple pommace until it gets to fermenting, which if put in a silo can be kept sweet through the winter. They will eat it, and like it, and it seems to do them good. They don't need a great deal of the fattening element, but they do need a frequent change. There is no stock but that needs variety from time to time. Sheep need warm quarters, but not too warm. A good many people have made a mistake by keeping them too close. Sheep need lots of breathing room and ventilation. Even through the winter months until the lambs are dropped there is not a great deal of grain necessary. Watch your flock. Keep them growing a little all the time, and the month before they are to drop the lambs give a little grain. You want to feed the lambs through the mother at first. My preference for a feed, if I could get what I want at this time, would be ground oats, and feeds that have muscle forming proper-

ties. I would not feed corn, or fatten the flock very much, for it will injure the lambs. The shepherd must be thorough, and give his attention to the sheep, from the time they begin to drop their lambs. It may take time when he would rather be doing something else, but we may be able to console ourselves with the thought that we have saved lots of time through the year while your brother dairymen have been milking. These lambs should be taught to eat grain as early as possible. They will begin to eat a little when a week old. If put where the mothers can't get at it, they will learn to eat it and will make a rapid growth. It is not too much to expect that lambs which are raised from our sheep in good condition, will reach a weight of from fifty to sixty pounds, when they are ten weeks old. If we are raising our lambs to fatten in the next winter, there is not very much to do. The lambs that are to be carried through and fattened the next winter don't need much grain through the spring, because there will be a stop when they go away to pasture, and it will be almost impossible to fatten the animal. The lamb doesn't want to stop growing until it is ready for market. Of course, in raising lambs, we must consider our own condition. We must figure out the problem for ourselves. It depends upon how close care and attention can be given the flock. You must give them warm quarters, time and attention. If you cannot do this, it is probably better to reserve the extra feeding until fall, and get the lambs ready for market the next winter.

There is one other matter that I wish to say just a few words about, and that perhaps will include all. The shearing of sheep —don't need to say as much about it as we used to, for we don't wash the sheep and shear them in the hottest weather. I don't think there is a more injurious process than this used to be, the method of washing and shearing them in the hottest summer weather, and then allowing the rain to come on to them. This work should all be done in the barn, and as soon as the first day of May. They should be kept in the barn and protected for a few days, say about ten, after which we find that the sheep can stand a good deal. The ends of the wool fiber have closed. The wool fibers are tubes. I have known a number of sheep to be drowned by the rain falling on them. These fibers close in a few days,

leaving the sheep able to go out into pasture where it can thrive and take on flesh. There is nothing to prevent these sheep from going on without any set back. A farmer can go through from this time until fall with no trouble. Give a little salt, but except for this, little care is required. One advantage of sheep husbandry is that we have more time to give to our farms. We are not tied up at home, but can go away and don't have to be there at milking time. Another advantage is that it doesn't require such expert men as in the handling of a dairy. It reduces the expenses of running the farm as well as the drudgery, and it adds to the revenue of the farm at the end of the year. I have tried to consider the sheep as it is. I believe it to be the most ruinous policy for the man who has sheep to get rid of them because they are low. It is a good time for the person who has a few sheep to cull them out, and get the best flock he can. I believe that the greatest success will come from adhering to sheep as a portion of our farm stock. The future changes in the markets will find an equalization some where, and five years from now we shall be just as apt to find men trying to get sheep, as eagerly as they are trying to get rid of them now. We must have confidence in farming, and try to make the best of it.

## DISCUSSION.

Question—I would like to inquire what you would recommend as the best feed for early lambs ?

Mr. Spear—The best feed that I have ever used for early lambs has been oil meal. I don't know of any food that you can get as good results from as by the liberal use of this feed. Some use bran, oats, and others cotton-seed.

How would you feed the cotton-seed?

Mr. Spear—Feed bran with it. I don't think I would feed it clear.

Mr. Fowler—Our farmers are not satisfied with the low price of wool. How much wool do you get on an average ?

Mr. Spear—About ten pounds.

Mr. Fowler—Some of us can remember that when we got five

pounds we thought that we were getting a good yield. How much did it cost to raise this ten pounds ?

Mr. Spear—I cannot tell exactly.

Mr. Fowler—We used to get 40 cents a pound, and that was considered an extreme price, while 20 cents is now considered the usual price. Now, how much are people losing when they get 20 cents a pound for ten pounds, when they used to get 40 cents a pound for five pounds ? I used to keep sheep, and I never got over fifty cents a pound. I never was successful in sheep raising. I claim that Mr. Spear can afford to sell wool, with his conditions of land and raising sheep, at twenty cents a pound as well as I could sell it years ago for forty cents.

Mr. Bennett—In regard to the dairy business, one town produces an average of over 250 pounds, and another one will produce less than a hundred. Please explain the cause of the difference.

Mr. Spear—To enter into an explanation covering the ground would require a very broad discussion of the dairy interests of Vermont. It would have directly to do with the number of cows, kind of cows, and quantity of feed we give them ; as I said, these statistics are for you to study. See the facts, and then try to improve on them. One fact I want to impress on your minds, and that is, the desirability of keeping a portion of our sheep to supply the home markets. Now all the towns of Vermont are inquiring for this product. During the last year I have had inquiries for mutton right in Randolph. If there is a demand we should try to supply it. There is no place where we can make such a profit as at these home markets, where we can put it into the hands of the consumer. In almost every town there is a demand for something we have. There is a demand right here at home for about every sheep that Vermont can produce to-day for consumption, and if we were alive here we would not have any trouble in getting rid of them at good prices. I want to leave this idea with you, that we farmers have got to be business men, just as much as the merchant. Look around and see what is the best way. When we see a new avenue that there is a profit in, we must get into it. At Manchester they have one of the best hotels in the country, and it

was full from the time they opened clear up to October. The manager of that hotel had to send to Albany to get his provisions—eggs, mutton and beef. That country was full of farmers, and they were grumbling at the hard times, when there was a market at their very door. We don't want to let such things go by, as they mean a big revenue for Vermont and Vermont farmers, and we can sell, I believe, every mutton sheep we have, if we would fit them and sell them when our markets want them. We have not as many sheep as dairy cows, but those we have I hope will remain.

Mr. Riford—I want to ask Mr. Spear what he would feed sheep before they were due to lamb.

Mr. Spear—My own practice is to feed bean and corn meal, sometimes whole corn. That I feed as a matter of convenience, because I can get it, and because it is perhaps the most economical way I can get it to them. I should like to feed oats, but that is too expensive; also a little oil meal—there is nothing better for the milk. A very good feed for sheep at this time, is a mixture of one-third of oil meal and two-thirds of corn meal. Mix it with an equal part of bran.

## SHEEP.

H. M. Arms—We have seen a time when it was very much pleasanter to speak on the sheep question than it is to-day. Even a year ago or less there was a better outlook than there is to-day. I wish I had thought to ask my friend Spear if there are any of that class of people here that don't like to hear what makes wool so low. If there is any one of that class here, we will say it is the fault of the Republican party. But we can't discuss the sheep question unless we look the facts in the face. One year ago when we cast our votes for the Mugwump and Democratic parties we made a great mistake, and we have got to endure it for four years.

Each class of sheep has its admirers, and each has much to admire. Each class is popular and deservedly popular, both here and across the water. I don't know as I can say which is best. We have millions of sheep in Vermont, and what are we going to do with them? Good wool is worth from twelve to fifteen cents a pound, and it costs that amount to raise it. It occurs to me that one of the greatest mistakes a farmer makes is when he changes

from one kind of stock to another, because one class of stock is not in favor. There was never so good a time as we have at the present to improve the stock, and I think there is no harm in letting our herds decrease. The change will come, and many sheep will be gotten rid of, making the market better. My brother Spear has coarse wool sheep and so have I. We could not get along without them. It is a fact that wool is worth almost as much in the Liverpool market as it is here. It will not pay to bring wool from a foreign market here for the price they can get there, and I much doubt if the heavy wools of the country would average much more than ten or twelve cents; but there is this question that we can consider when wool is so low—it doesn't cost any more to raise the wool, and not a pound of wool is grown in this land more than is needed to clothe the people of the world. The destruction of the sheep will be immense—it has already been immense; and I think that some of our western friends would tell us that they had shipped sheep from the west without getting returns enough to pay the freight. I have seen in market some of the finest mutton sold for three or four cents a pound. They are crowding the market, for they have sheep that they must get rid of, and this gives us a chance to keep our stock. Now if I had advised any farmer to keep sheep, I would advise him to keep on raising sheep. I have sometimes advised the keeping of sheep in a cow pasture to get rid of the noxious weeds, but when I got warmed up on the subject over here in Concord, one of my brothers on the Board did not agree with me. He said if we kept sheep we should not turn them in the pastures with the cows, for they ate the very best of the grass—they would not give it a chance to grow.

One of the advantages of keeping sheep is that they provide for us meat, and in a condition that any of our farmers can handle it. It is the healthiest meat we have, and one that is going to be a necessity. We have seen the time when we could not go into a market and buy a bit of mutton for less than twenty-five cents a pound, and there is not a farm in the State where they can not use the over-supply of sheep right on the farm. I went to Mexico when I was thirty years old, and lived on mutton. When I went there I weighed only 163 pounds, and when I left I weighed 266 pounds, a

gain, and of clear mutton. This shows what mutton can do. Now as I said before, every pound of wool grown in the world is used, and it may be a special dispensation of Providence—some call it some other dispensation—that the market is so low to-day. There is no doubt that in this country we can grow any amount of wool, and grow it to advantage. The same is the case with our sugars. The South, Kansas, Nebraska and California could have raised all the sugar we needed, and kept the tariff right here at home. It is impossible for us to calculate exactly, but we can take the known facts and figure out the results, showing the necessity of raising wool and using the wool we have. Here in Vermont we shall not affect the market much in wool producing. The first thing we excel in is our women and our men. The next, our horses and dairy. There was a time when the growing of Merino sheep was the greatest industry of the State.

None of the Australian or Southern wool growers can grow their own stock independent of us—but they must come back to us and get the blood for their sheep. On the frontier, sheep will deteriorate, so that breeders from South America, Australia, and the frontier must come back to us for their stock sheep. The raising of mutton is a growing industry, and it is not an expensive way to stock up. Intelligent men have told us where it has been an advantage to them to keep a few sheep in their cow pastures, as it enabled them to keep more cows because their pastures were better for having the sheep there. We can use sheep to advantage even to our cows—for in our back pastures or large pastures, there is no animal that is so fond of browsing as the sheep, and they will get rid of more weeds, and improve the land more than any other animal we keep; and discouraging as it is, it would be much more discouraging if we should do away with the stock as we have them to-day.

Mr. Spear—We don't want to lose our heads on this sheep question and do anything that is reckless. The American people are too apt to get scared, but as soon as they come to their senses and look around, they see what big fools they were. So long as there is a demand for the products of this country, there is going to be a way of producing it. When our people read of the diseases afflict-

ing pork and beef they are apt to be frightened, and to hesitate to eat the beef and pork set before them at the hotels. But there is nothing the matter with mutton, and it is surprising to me that it has not gone lower on our markets than it has. The prices have been better than any of us expected. There is a future in the sheep business if it can stand the strain—even if we don't get anything for the fleeces. I believe that in many places it will be better to keep more of them, than to put them entirely aside. Another reason for my belief is, that so many are going into the dairy and into horse raising; I never knew things to go in this way without a reaction. It is inevitable. In five years these same people will be as ready to go from cows to sheep, as they are now to go from sheep to cows. The more seldom we change, the better off we are. When we get a business that is adapted to us and to our conditions, it is better for us to keep at it.

Mr. Flagg—I will say a few words in regard to this sheep question, about which we are all interested, because so many of us are engaged in raising sheep. One of the first laws of nature is self preservation, in obedience to which we must get something off from our farms. In this life we need a variety, which the sheep help to make up, the sheep upon which there is none not dependent. There will be millions of sheep slaughtered in the United States, while statistics show us that the United States produces but a small proportion of the wool that is used in this country. We are sending away to-day to foreign markets all kinds of meat and products, and by return vessel are bringing back wool. Then why not foster the industry? Wool is a necessity, of which not enough is raised in the country. Then why should we not protect our own industry? In Texas wool is sold for seven and a half cents; in Canada for seventeen, while across the line it is worth twelve cents. Is that the way things should be? Talk about our having a great surplus of sheep! The people of the United States to-day would be without wool if it were not sent in. I have on my farm four hundred and twenty-five sheep, and there is not a sheep there that goes hungry, because I believe sheep and wool are going to bring better prices. My wool is packed away in a good dry room, and I expect to get a better price for it soon. I believe we

should raise our wool and protect this industry, until they cannot ship wool into this country—because we have a plenty of our own. What would we do without wool where the thermometer gets as low as it does in this country? We believe there never was a better time to get a good flock of sheep than now. A man who does not like sheep should not keep them, just as in the case of other animals. This industry should interest every one of you. It is a necessity that we cannot get along without, so I believe that the wool industry is sure to boom in the near future. At present, fall lambs can be sold in the State of Ohio for twenty-five cents, and in the western States they are killing them by the thousand. One year ago I sold twenty-two sheep for $240. I think the demand will again revive.

Our hill farms must keep sheep. I must keep sheep, for my farm is so situated that I must drive so many miles from my home farm to my pastures, I could not keep cows with any profit. Many farmers are similarly situated.

Mr. Gabrilson—The question was started on Shropshire sheep, and we have drifted away to the subject of keeping small sheep. We have less sheep now when we are keeping them for wool and mutton, and the Shropshire sheep answer this purpose very well. One point lost sight of in regard to sheep, is that they make the most of the food they have. No mature animal gives us so much out of the food as the sheep. I should think it would pay you to raise lambs for market here in Vermont where you can get them to market so easily. We have kept a flock of Shropshire sheep for fifteen years, and have lived through one or two of these depressions, which occur once in about five years, I have noticed, with renewed vigor. The Shropshire sheep yields a more valuable wool and better meat than the other breeds, is quite hardy, a good natured sheep, and makes the best use of what it gets.

Mr. Stiles—In my early days almost everyone kept some sheep with the cows, in those days when the wool brought something, but at the present time the wool has become a by-product. I believe that sheep can be raised at a profit for mutton and lambs. My neighbors sold their lambs for four and five dollars a head this last year.

The keeping of sheep is as ancient as any industry. Abel was a keeper of sheep, but I presume there was no tariff on wool in those days. I used to read that it was better to keep sheep, because then we had something to sell from the farm. Now, I read that we should keep a dairy, because we can draw a check once a month. Several years ago as I had not much property, I took a farm and had thirty-five sheep and twenty-two hens, besides other stock, and the avails of those sheep was a little over $43. I kept account of the income from the hens and it was $69.95.

Mr. Scott—I had a lamb given me a few years ago, and from that I sold five lambs for $43. This last spring I had five lambs from five sheep, for which a man offered me two cents a pound. I think it was owing to Democracy.

Mr. Sanford—This shows that wool is cheap enough. As I look over this broad question as it appears in this whole country, I wish that every woman and child could have all they want so cheap, that we should not regret the buying of a new suit of clothes as we have in the past. At the same time I would like to have the price so high, that the hill pastures would be covered with sheep to supply the demand. Every man should be a specialist in this business, as in everything else. They know what their sheep is. I know of one man who fatted cattle for market and made it a specialty. He steps in with his beef and knows just what he can do with it. So I say, situated as we are here in Vermont, so near to these good markets which are calling for the best we can produce, that we should take advantage of these opportunities, and produce what the markets call for. I believe that a man to-day can make a success of keeping sheep, or of keeping anything, if he will give his attention to it. Any business needs care and attention.

Maj. Alvord—I agree with many of the gentlemen who have spoken on this subject, and differ with some of the others. I believe in every farmer's having a specialty, but not in carrying this specialty to an extreme. So for many years my specialty has been that of a dairy farmer, but one of the things which would be the last I should give up, would be my little flock of sheep. I would no sooner go without from twenty to thirty sheep, than I

would without the poultry or fruit. Because my sheep have not done so well this year as in the past, I am not going to give them up. I believe that this business will be profitable again, as I believe that my orchard will be profitable. I have noticed that the little wool I was selling was getting lower in the last few years, when prices on sheep have been very fluctuating in proportion to the increase of population or farm stock, for which reason I believe that there is a good time for sheep not far ahead of us. Now the sheep I am trying to find is the one that cannot be hurt by the people's vote. If the farmers of Vermont have a sheep that they must get rid of, if the State of New York or Pennsylvania happened to vote the other way, they should not keep that kind of sheep. I suppose that it is a fact that the people of this country, at the present time, are so equally divided, that the floating population tip the scale either way. They are ready to vote for or against existing things with little provocation. I have been unable to see thus far how this floating population can make my little flock of sheep of less profit to me. I don't believe there is any connection between the sheep industry and the way the vote turns. The fact is, that sheep and wool have been tinkered by law more than any other farm product, and this has affected more or less, at times, the value of wool. The fluctuation in kind and quality has not corresponded with the change of the laws. Some periods or seasons of the year when the wool market was the most active have been when the tariff on wool has been the lowest. Then, again, some of the periods of the greatest depression have been under some of the highest taxations that this country has known. The depression of the last three years was that which began before the McKinley bill, and lasted during that fall; and in a discussion of the National Wool Growers' Association at Chicago, the largest wool producers in the State of Ohio and the leading wool dealers all agreed that the low price on wool during the last two or three years was the result of internal causes, and not of legislation. I hope we can feel in the future, if we have not in the past, that we can do our farming in any part of the country, without asking the State of New York or the Island of

Manhattan which way they are going to vote. I don't believe in having the price of a colt fixed by legislation, and if I am raising a colt the price of which is going to be affected by legislation, I think I had better go out of the business. I think it true that this country is not producing enough wool for its consumption. I am not surprised at what has occurred on these Western farms, where the depression in cattle has been just as great as with wool and sheep. No one has been responsible for this. The transportation and freight was as much as the value of what they produced. I want the sheep that will be least affected, if sheep are affected, by any possible legislation. It should be a sheep whose general value is not in wool; and that brings us back to the Shropshire sheep. If there has been any single peculiarity or quality that has made the great success of the Shropshire in this country, it is its cross on fine wool sheep. It seems to me that the Shropshire sire is the sheep that the farmers of Vermont should use, to get a crop of lambs which don't have to be sold for a dollar. My lambs average me nearer five than four dollars. I believe the Shropshire is the cheapest and best sheep you can raise.

Mr. Gabrilson—There is not another kind of meat that can be produced so cheaply, and that is so nutritious, as mutton raised on one's own farm. It costs less than any other kind of meat. I should like to get some of those dollar lambs that I have heard so much about, and I think they should bring more.

Maj. Alvord—I heard of some of these cheap lambs being taken to Washington, which, not finding a market, were sent on to Baltimore and were sold at seventy-five cents each. I then ordered a hundred lambs at a dollar a head, but was told that they could not be supplied to me at that price, but that I might be able to find what I wanted at $1.50. I did not get them for they were sold at $2.50 or $3.00 a head.

Mr. Bowman—I came here twenty years ago, and at that time there were few dairies here, but each man had a flock of sheep. Since that time farmers have gone to dairying, for what reason I do not know, unless it be because they get their pay for their butter and cheese every month. I have a nice flock of Shropshire

sheep. When I came here it was nothing but sheep, to-day it is dairying.

In regard to the tariff question—If the tariff was for free wool, we would get as much for wool as we are getting to-day. Speaking about the class of sheep—I never had so hardy a sheep, or better sheep to take care of, than the Shropshire. I saw some Canadian sheep whose lambs we thought were going to outweigh the Shropshire, but the Shropshire's did better.

Mr. Perham—The sheep problem is a great problem. A good article can always be sold, and that is one reason why the dairy business is taking so well; if we can get a uniform article we are sure of a good price. As to sheep—when wool fell from ninety cents a pound, twenty or thirty years ago, we thought the end had come for that industry. Then we got a coarse wool sheep, and crossed it on a fine wool, which we found made the lambs stronger and better. Weed your sheep out and keep only the best. The Australian sheep are best for smooth sheep and long wool. These crosses give better sheep and a sheep that will furnish more milk than the lamb wants, in consequence of which you will have a good lamb.

Mr. Fisk—In regard to the Merino sheep business of this State, you find that there is nothing left of the Merino sheep. They have degenerated, for the finest and best have been sent to foreign markets. Now the question with me is this—Can the average farmer to-day raise a sheep with any profit, and look to South America or Africa for his profit? In talking about this question of tariff, I know quite a number that are ready to find fault. I have sold wool for fifty cents a pound in days gone by. My friend Spear wanted to buy the same grade of wool for sixteen cents a pound. Now, what I wish to know is, why that wool should fall from fifty cents a pound to sixteen cents a pound with a Republican administration? Was it a premonition that there was to be a Democratic administration sometime?

Mr. Gabrilson—I confess that I know just nothing in regard to the tariff. I have raised sheep without regard to the tariff, and have raised wool as a by-product. It is no trick to make a three months old Shropshire lamb weigh a hundred pounds, and find a

good paying market for it. What are the points of a full blood Shropshire?

Remark—I don't know about the points, but I have had a flock of full blood sheep sixteen years, and have found that the Merino ewe is the best for crossing. The milk can be made up by giving a little grain.

Mr. Gabrilson—Do you call a full blood as tough as a half-breed?

Remark—I don't think the grade animal more hardy than the full blood animal. This matter of refinement injures their vitality.

Mr. Farrow—How does this apply to the thorough-bred horses?

Mr. Gabrilson—The law is shown in the Bronchos on the plains. They have the greatest power of endurance.

Question—Do you ever have trouble with your Shropshire sheep scouring?

Remark—No. I have had trouble with their lambs scouring, and laid it to the grass coming very early, thinking that the ewes ate the grass and injured the lambs. Since then I have kept the ewes off the grass, and have had no further trouble.

# SWINE.

## MARSHFIELD INSTITUTE.

### SWINE AND THEIR DISEASES.

Hon. D. P. Ashburn, Nebraska—When my friend Arms invited me down here to participate somewhat in the work of this nature, and insisted that I should come, I insisted that it would be a waste of time to talk to the people of Vermont upon questions that they were better informed about than I. He says, "Now look here, Ashburn, you don't take me for a fool do you? You don't suppose I want a smarter man than I am to come and take all the glory off from me! "I see by this programme that the Hon. D. P. Ashburn is expected to talk to you this afternoon on Swine and their Diseases. Now you would, I suppose, expect one with such a title, to be able to tell you all about Swine and their Diseases. I don't want you to get such a notion as that, for you will have to come down from that this afternoon. When we come to discuss swine this afternoon, I will speak to you from the standpoint of the man from Nebraska, who is running a creamery, and who has raised swine in connection with it, and a fellow who has been pretty well used up by hog cholera, and it is of what I learned at that time that I want to talk. I want to speak about western hogs. We have spoiled our western hog. In the West we are using the Poland China hog, for it will mature earlier with us than other kinds. With our cheap corn, hog raising is one of our chief businesses. In connection with creamery and dairy work it is becoming a large adjunct to that work. It may not be so here, for circumstances may differ. We wave shipped from our town of a thousand inhabitants one hundred car-loads of hogs a week. That is characteristic over the whole State; and you can see the number of hogs that is required for breeding purposes, and it takes

quite a business to raise these hogs alone, which are sold for a great price. We breed for points, and putting on flesh, so we have spoiled the hog in that way. We spoil the breed for fat, and here comes in a serious trouble—where we used to get ten or twelve pigs at a litter, now we only get five or six scrawny little pigs. We must get back to first principles. The practical man recognizes that the Poland China hogs are ruined, because they wished to get something very fine and spoiled them, as they have the Jersey in breeding for points, for butter, and for color. Gov. Furness has gone South, and is to make a new start. He bought four or five sows and a boar—the wood-ranging hogs of the South for his start, and is going to try to improve his breed by crossing with this hardy stock. The story goes that a Northern man went down there and took some hogs, that we considered fine, so fat they could hardly walk, and no one at the fair paid any attention to them but passed them by, stopping and gazing with admiration at the thin, ungainly, long-legged Southern hogs. Finally he asked a man why no one stopped to see his exhibit of hogs and the man replied, "Well, Colonel, I reckon they are not good, they are no kind of use to us. We can't use them. They can't run; they would be no use to us sir, for we can't keep a hog that can't outrun a nigger." Well, he has here gotten the first principles of vitality of the hog. I wonder if we are not doing the same thing along other lines. I wonder if the hog with its great powers of generation has not been bred too finely. By and by we shall come to see that the same principles apply as to other stock. There is a necessity for this change in the producing of the hog itself, in order that we may keep ourselves supplied. The English pay just as much or more for a lean hog. We have an excess of fat and too little lean. Those who watch the market report will see that what we need is hogs with more lean meat. Up to the present time lard has been one of the great products of the hog, now cottolene is taking its place, and the question is—is it not a better product? Is the vegetable oil better than the animal oil? We are going to make a radical change from lard to cottolene.

As I said before, I was to discuss only one question, and that is hog cholera. In doing this I will use no medical terms for

two reasons—they are seldom understood, and besides I don't understand many of them myself.

Hog cholera, like many diseases, but contagious diseases especially, is caused by a germ of vegetable life, the lowest form of life. There are a great many kinds—some are enemies, some are servants, some you use in the making of bread. We use bacteria to ripen cream. Another class of bacteria, or germs, brings the small pox, Asiatic cholera, or hog cholera. Let me digress in order to make an explanation. The Asiatic cholera in man affects only the intestines and alimentary canal. Dr. Billings was in a pest house in Asia during the epidemic of cholera there, studying the disease, and he found this to be true in every case. In the book Prof. Hills spoke to you of yesterday, it says that only the alimentary canals are affected. Let me explain how it operates. I want to talk of something that will be of help to you, and that you can act intelligently with. These germs are very small and only with a very powerful microscope can they be seen. You can see them floating in a kind of fluid that contains them. First you will notice it as a little dot, as if you just touched paper with a pencil. It will float, move around, and get a little longer until it gets about three or three and a half times its original diameter. You will see between the two extremes a yellowish fluid which, when this separates or breaks apart, is emitted, leaving two parts which will take on the form of the first. You can see how rapidly these germs multiply. I have seen three of them do this in as many minutes. It is the yellow fluid that is poisonous and which must enter the system of the hog through his mouth, nostrils, or any other opening, and is quite different from the Asiatic cholera which has to be swallowed. The system of the hog is not good ground to raise this plant in. A few generations, a few days and the original germ with all the germs will become weak, and if the hog has sufficient vitality it will recover. The truth is, these germs are constantly being dropped on the ground and will come back with all their renewed vigor another season. If we can keep the hog from constantly taking in new poison, his chances are very great in favor of recovery. We must isolate the hog from his old surroundings and keep changing him. What has been

done to meet this disease? The conditions of this disease, as I have explained them, are like the small pox. In non-recurrent diseases, like the small pox, the disease can be cured by having it once. Science has helped us here, and we can have our systems freed from predisposition to the disease. A virus is obtained that will produce the same effect on the system and still keep it from having the disease. Just a little history of the efforts of Dr. Billings along these lines may be interesting. He had been a student of Pasteur, also in France and Germany, and took up that line of work. He had the best facilities for this kind of work, and made it his work. He went wherever it was, wherever hog cholera broke out. He put some of the germs into beef broth and they developed very rapidly until they had taken out all the nourishment there was in it and then they would die. As they were beginning to die he would take out a few and put them into other broth, getting at last the 187th culture. Now while doing this he experimented on guinea pigs, dogs, rabbits, etc. With a hypodermic syringe he would introduce some into their system and notice the effects, and in a year or two he had found the stage at which these could be put into the hog to keep him from the disease. He made a complete success of it.

If we had a Dr. Billings in every part of the country with his judgment, and could give every hog this treatment so that it would never have the disease again, what a blessing it would be; but that is impossible. The average man would not take the same care of the hogs; they must be watched and cared for through the whole process. He might inoculate the hog and make it the center for the disease, not coralling it nor stopping it. The danger was so great that it was necessary to set science at work to produce a virus to prevent hog cholera, i. e. to produce the effect without producing the disease. That is just where the general government and Dr. Billings are. Unfortunately Dr. Billings is not a chemist and has had to let the matter rest. It is the work for a chemist, and it seems to be a matter for the general government to take up, for the disease should be stamped out. It seems to me that your interests perhaps are not sufficient along that line to warrant your spending your time in doing this work, except to prevent its spread.

As to a preventive of spreading. You get the disease no doubt in the shipment of hogs from the West. The eating of, or feeding of offal from diseased pork, the continual droppings from the cars, the shipment of corn from localities where there are dead or diseased hogs, run into the grain bins, are the way that you get the disease. One of our troubles is that we do not burn or bury the dead hogs as we should, nor disinfect. If my hogs had hog cholera I would isolate them and move the hog pens every day, covering the ground with straw which I would burn. This would kill the germs; disinfect with a solution. Another way of spreading hog cholera is a very common one. You hear that your neighbor is troubled with it and you go over to Jones' to see how hog cholera looks. You note their symptoms, get over into the pen and stir them up to see how they act. Then you go home and look at your own pigs and wonder if they have the cholera. You get into the pens and stir them up, in this way carrying the germs of the disease right to your own hogs in your clothing and on your shoes. In a few days your hogs are down with the disease too.

I was called away from home when I had 225 fat hogs which were all well. While I was away hog cholera broke out, but I could not go home and I wrote home for them to do the best they could. They had heavy rains and the pens were flooded so that they were in the mud and slush two feet deep. They stood in that mud a month and never took the cholera, although the hogs all around us died. We thought it very strange, but you see the germs could not live in this mud. It killed them, as they soon took from the mud and slush all that could keep them alive. The next year I wanted to take every precaution against the disease, and so I built new yards and put each part by itself. I fixed it up nice and was going to raise my hogs so clean that hog cholera would not touch them. I thought if we could only keep them clean and give them a good situation we would not be troubled. I built the pens on a side hill so that there would be no danger of the pens flooding that year. I put in these pens a bath and running water. When it did not rain we raked it out and kept it clean. That was when the hog cholera took me. If I had shot

them it would have been worth much to me, but I did not and they were all infected. It was then that Dr. Billings told me what I have been telling you about, and I inoculated my pigs. I have never had it since.

The government, when investigating this, came and bought five or six of my pigs, took them to Washington and tried to give them the hog cholera, but failed.

At Peoria they wanted to feed hogs from the distillery and so they got a herd of hogs from our vicinity, which they put right in with their hogs. They didn't take the disease, but were fattened for market, while their hogs had it and many died.

About our hogs growing weak. We saw they were losing their vitality, and consequently I bought 60 or 70 hogs, among them an old sow, a southern rail-splitter. I had to take her in order to get the rest, but she soon dropped me twelve pigs well bred on the other side, which jumped up and responded so quickly to feed and matured so rapidly that I was pleased to own her. However, I could not keep her anywhere, the only way we could do was to keep her in a barn with the roof on. Hog cholera broke out in one end of the pens and went across diagonally as the wind carried the germs. When it came to where that sow was I thought it would have a tussle now, for there was no lack of vitality, but in just three days from the time she showed the first symptoms she died. It is not lack of vitality. The most perfect in form and vitality will be the first to succumb to typhus fever, and so it is with this disease. Again when you get it, do what you can to prevent its spread. Science has done no more for you than to tell you what it is. In a word, keep it away from your hogs, using every precaution possible.

DISCUSSION.

Mr. Pike—I would like to ask what kind or breed of hogs he would select for lean meat ?

Mr. Ashburn—I thought I had fortified against that question with the others, when I told you I did not know. I think we have to go back to our present breed of hogs. I think the one that sold best was the Southern hog.

Mr. Pike—Would you favor the Essex?

Mr. Ashburn—I think the Essex a good hog.

Mr. Pike—I would rather have it than any other breed. Mr. Fisher had that breed when I called there to see them last year. They were fine hogs; there is not so much fat, but a greater proportion of lean meat. This year we have Essex.

Mr. Spear—I am glad this subject of cholera has come up here for discussion; it may not interest you here this month, but it may this winter. It came near Manchester last winter and may come here this winter. It would have been of great service to us last year if we had known these facts last winter. It was practically the first rage this disease had had in the State. We want to be careful and not get it on our farms. It comes in so many ways that we have every reason for exercising every precaution, and for being particularly careful to keep out the disease.

Mr. Gabrilson—In disposing of the dead hogs, instead of burying, I should burn them, for when buried there is danger of their being dug up by hogs or dogs, and the disease being spread in that way.

Mr. Hill—I don't know as my hogs had the hog cholera, but I had some trouble with them. Mr. Spear said it was hog cholera, and I killed the hog. We lost some other hogs in the same way, which we burned. But one recovered, which I fattened and sold. I stocked up with new hogs after disinfecting, and have had no further trouble.

Mr. Gabrilson—Is it true that the germs don't live through the winter?

Mr. Ashburn—They have been known to live all the year round. They must be subject to a very hard freeze in very wet ground, or if you can raise them to a heat of 165° it will kill them, but no matter whether hot or cold, if dry they will live. Warmth and moisture are necessary for rapid development.

Mr. Pike—I have used boiling water.

Mr. Ashburn—Water boils at 216°, and therefore is hot enough to kill the germs.

Mr. Sanford—I was especially pleased with the remarks of our Western friend, for on one point he confirms my theory and belief

that the use of hog lard is growing less, and that we buy cottolene, a pure vegetable oil. I live near Massachusetts, and not many years ago the hogs were shipped to Boston from the West, and spread the cholera, and cleaned out the hogs along the line of that road. Massachusetts spent large sums of money trying to get rid of that disease, and their committees have decided to let it alone. This gentleman says that it is the best thing to move the hogs that have the disease, and they do it—they move them—right for the depot. This question comes up to me, is it well to have much to do with them, and I think that when they went into the sea they should have stayed there. I don't want to have anything to do with them. There are plenty of ways to get rid of skim-milk instead of feeding to hogs. I send mine to North Adams. The skim-milk is all sold at three cents a quart. If you can't sell it for that, feed it to the cows or the poultry—let the hogs go.

Mr. Winslow—About a year ago I wrote to the chairman of the Cattle Commissioners, and asked them if they would give me what information they could in regard to hog cholera—how to get rid of it. In reply he wrote that it had always been a theory with him that those who used swill from hotels got the disease from the bits of fresh pork. They had issued circulars and tried to have the people stop using these feeds. Wherever there was any disease the hogs were killed and they put a quarantine on the hogs. Just so long as they would pay for sick hogs, they would have the cholera. When the hogs *had* to be taken care of by the farmers it was different, they would take care of it and it was stamped out. It lies in the hands of the farmers to stamp it out.

Mr. Vail—In regard to lard I have had the same prejudices as Mr. Sanford and I believe in cottolene. But my wife says she can't bear the taste of it, and says I don't eat her cooking when she uses it. I lost some of my prejudice, however, when I found that cottolene was not a pure vegetable oil—it has a good deal of animal fat in it. Now I should discuss this question just as Bro. Sanford does if I were situated just as he is, if we could sell our skim-milk for three cents a quart, but we poor fellows who live way back on the mountain must do the best we can with it. I don't wonder that when my friend Sanford can skim his milk and

sell his butter at prices way beyond us, and sell his milk for three cents a quart, that he is opposed to the raising of these animals. Now all the fertilizing element is in the skim-milk. If he sells it at this price he can afford to buy fertilizers, but there are people up our way who are selling their skim-milk, sending it to Boston for two cents a quart. As I say, he can afford to buy fertilizers, but those who sell it for two cents a quart are taking the fertility off from their farms. There is not a farm that would not see the loss of the skim-milk in the fertility. I make a great deal of the fertility that comes from skim-milk. It is the one thing that holds up the lands. Wherever you strike a dairy section you can almost pick it out by the new buildings, and the general thrift of the farms. You know that there they have kept a dairy, that the milk has been consumed, because they have only sold the butter off and kept the skim-milk at home. Their farms are more fertile, and the places show it.

Question—Is the raising of pork profitable in Vermont and, if so, at what age and what size of hog is the most profitable.

Mr. Arms—For the past two years pork raising in Vermont has not been very profitable. It is conceded that if a pig has to weigh over 150 lbs. it costs more to increase its weight than before, and it has been proved by experiment in the last two or three years that 200 lbs. is the maximum of profit. In the last few years I have fed the offal from the creamery and have fed my hogs on butter-milk. I intend to have them weigh 150 or 200 lbs., and would sell for less but there is not a market for less.

## "VERMONT AT CHICAGO."

### MARSHFIELD INSTITUTE.

H. M. Arms—When I speak of Vermont at Chicago, I am aware that I am probably addressing those who were there, and who perhaps saw as much or more of the great Exposition than myself, and perhaps know vastly more of Vermont's success in the exhibit; but there is one thing every one does know who was there for any length of time, and that is, it was the greatest educator the world has ever had; all nations vieing with each other and each striving in a commendable competition to outdo the other. Vermonters could see the world by going to that "World's Fair", as nowhere else in any one country. And I venture to say no man or woman from Vermont who attended the Exposition, at no matter how great a sacrifice, will ever regret the cost. And it is safe to assert that never again will such an opportunity be given any of this generation. Vermont seemed, perhaps more than most any other state, to send her citizens there, and it was encouraging to any loyal Vermonter to meet the scores and hundreds of Vermonters there. More than all, the children of the Green Mountain State now living outside her borders came to meet other Vermonters as well as to see the grand Exposition, and they proved, what we always believed, that a Vermonter is always true to his or her State, as are the citizens of no other commonwealth. It may be of interest to some of you if I recall the circumstances under which our State got the appropriation for the Columbian Exposition. During the session of the Legislature of 1890, a bill was passed appropriating $5000 for this purpose, and this was by some considered a liberal appropriation; but when an extra session was called in 1891, the matter was brought before that body and a more liberal sum was urged; an additional $10,000 was appropriated, and with the sum of $15,000 preparation was made to exhibit our various industries and to put them in suitable position to be compared with the

industries of other States. The sum was still so small the commissioners felt that all was needed for the different industries and we had no headquarters; but, knowing the spirit of our men, the Executive Commissioner, Hon. H. H. McIntyre, secured pledges of one hundred dollars each from one hundred of our public spirited citizens, and the work of planning a Vermont house went on. At the next meeting of our Legislature, this sum was easily obtained from the State, with an additional $4,750 for finishing and furnishing the house, and the commissioners accepted the plans of a Vermonter, reproducing an ancient Pompeian villa, which was known as the Vermont house, and which was a great disappointment to many a Vermonter, as not representing Vermont. But when the committee reported on the different structures, Vermont stood second in the entire list with her building, which was by those connoisseurs styled a "gem of art".

In order to place our productions and our stock before the world, the commissioners made a distribution of the amount at their disposal, giving the different classes of stock sums of about $1000 to each, to assist them, and with this aid we sent some of our choicest stock as well as some of the best of our other productions. In the dairy stock we had a grand exhibit of Jerseys and Ayrshires. In sheep we had both the famous Vermont Merino and a flock of Southdowns. In horses of course Vermont showed her Morgans. Other industries included the finest and largest exhibit at the Fair in both marble and granite, and our dairy exhibit in butter led the world. It is a difficult matter, even at this time, to tell just what we did in our various exhibits as compared with other states, as the committee on awards are men who expect to live a long time and don't seem willing to be hurried. I am not able to tell you all we achieved in any direction except in the one branch of which I had the charge, the dairy products, but, as you already know, our stock exhibit was a marked success in every branch. Our Vermont horses more than kept the reputation we established years ago for that stock, and though we had a very strong competition from other states, we had the pleasure of seeing our full share of awards distributed among our 28 Vermont Morgans, with the highest stallion prize coming to us as a matter of course. Our

Ayrshires also led the whole Union in the show ring, and the two splendid herds of C. M. Winslow of Brandon and L. S. Drew of Burlington, were the pride of the United States. Our Jerseys stood the tests in the first 30 days cheese test, second 90 days butter test, and the heifer test of 30 days near the close of the Exposition. It was our pleasure to see those splendid cows in a stable, without the fresh and luxuriant pasture, hold up in vigor, and produce constantly the large flow of high-testing milk, which put ours only second in the entire exhibit, and we had the satisfaction of knowing that many an unprejudiced dairy and stock man said ours were without doubt the best.

It was one of the greatest misfortunes that occurred in this exhibit when the splendid cow, Princess Honoria, of the Billings herd, lost her life as the result of a long-continued season of hot weather, just after she gave birth to a calf on the grounds. Everything that could be done to save her was done, and the Supt., Hon. Valancey Fuller of Canada, was almost heartbroken when he saw she must die. One feature, showing the care taken to save her, may interest you. Miss Fuller, daughter of the superintendent, sat beside Princess Honoria for hours, fanning her to relieve her of the intense heat.

This Vermont cow had a record at 3 years of age of 23 lbs., 10 oz. of butter in seven days. It is stated that Mr. Aitken, agent of the Billings farm, said when the cow was sent to Chicago, it was about an even chance if she survived, but if she did she could bring the highest record to Vermont, and no one who saw her could for a moment doubt it, had she survived the test.

Our Merino sheep were the best on the grounds. This we expected, but for some reason, suspected by most of us, and denied by some, the interest in wool producing sheep is on the wane, and while, as stated, we had the best, they did not attract the attention they would have a few years or even a few months earlier, under the old dispensation. Vermont can and does produce the best Merino sheep in the world, and other countries have to send here to replenish their stock, or it will depreciate in value. Our own frontier, while we had a frontier, which we have not now, has been compelled to send to us for her stock sheep, as they will deteriorate

in the west and south, and while I am no prophet, I am free to say that I believe this class of sheep must be kept up here, if we look to our own interests. It is a painful duty to state that of our Vermonters in charge of our Merino exhibit, two of them have died as the result, probably, of their exposure in that line of duty.

It seems, perhaps, discouraging to sheep growers, to have wool go so far below the cost of its production, but there seems to be a reason for it just now, which perhaps I had better not attempt to explain. [Laughter.] I guess I might have trusted this audience with my opinion of the reason for this decline, but let me urge you, do not be discouraged.

The use of mutton as a staple food is getting to be more general, and we can raise sheep of the coarser and middle-wool classes for that purpose, even if we cannot sell our wool at a price to pay its cost. In this class (middle-wool) the estate of Frederick Billings showed a fine flock of Southdowns, bred direct from their own importations from England, from the Prince of Wales' flocks, and they brought home several awards.

The maple sugar exhibit was very limited, and, if memory serves me right, only 34 samples were shown from the State that of all others could have shown a hundred samples of perfect sugar. The number of samples of syrup, or of its standing, I do not feel sure but I think Vermont took an award on every sample shown, which was said to be the case in the sugar exhibit.

Vermont's leading industry is her dairy industry, and in this department I am able to give you perhaps a more satisfactory report than I could of any other, as it was my special care during the four months in which dairy products were exhibited. You will realize at once how great an advantage some of the Western States had over Vermont in this line. Illinois, the home of Elgin, could put her product in the exhibition cases at 24 hours old. Wisconsin could do the same, while our butter had to be at least two weeks old and to be carried from nine hundred to eleven hundred miles before it could reach the exhibit. Our first butter was made the last of May while our cows were in the transition state, between hay and grass, and it was more than two weeks old when it was scored at Jackson Park, and still we took a much greater per cent.

of "perfect" or hundred point butter than any other state or country that competed. And let me say right here, in getting these packages for testing I sent out circulars to every prominent dairyman I could find the address of, to every creamery in the State, and I took to Chicago every package of butter sent me without any selection, or rejection, no package being scored or examined until it came before the experts, during all the four months of the competition. In July, no butter scored a hundred points; we had more critical judges, men who knew the worth of flavor and who had had large experience in this business ; but Vermont had a score above the world in this exhibit, as she did in September and October. This question has often been asked me, "How is it that every State claims to have beaten Vermont," or "How is it that every State claims the first place in the dairy exhibit?" Is have but one answer, and that is the same as the answer to a boy's conundrum with which in my childhood days I used to be puzzled, *"The boy lied."*

The fact is, there was no competition as between states. Our dairy products were shown and judged on their own merits. In June every package scoring 97 points received an award. July was less, and September and October delivery was even less than July, and all butter or cheese scoring above those fixed standards is to be awarded a prize—in the sweet By-and-By. Our one cheese, made by P. McDonough of Hinesburgh, was of a most perfect flavor, a soft cheese, and scored 95 points, receiving an award. Some states claim a very high *"general average."* Now a general average can be made only when the states have each an equal proportion of each class of the goods. Some states showed almost wholly creamery goods, while Vermont's exhibits were largely dairy manufactures ; and still other states are said to have selected their butter, and rejected such as scored low, while our exhibit showed what Vermont is doing in the line of her leading industry, while she led the world with the highest score at every competition. I cannot close my remarks without paying a just tribute to our competitors from other states. I have never met a more manly, honorable, high-minded class of men in any experience in life than those superintendents of the dairy interests of the different states represented in that great

competition. The Executive Commissioner of Vermont says the cost of the dairy exhibit to the State was about $1200.00. There was a shrinkage from various causes, and it was my pleasure to donate sample packages of Vermont butter to several prominent parties in different sections of the country, even sending some to the remote south, where Vermont butter was discussed by a Board of Trade and another prominent organization, and it was praised by all. "The largest creamery of the world" was very generous in sending extra tubs to help out our exhibits, and that creamery scored higher than any other in the country for the four months in which butter was exhibited. It was my pleasure and pride to accept the congratulations of the Superintendents of other states, each one of whom was a friend, though a competitor, and the expression of one may interest you. He said: "We came here to win; but if we must be beaten, thank God it is you and old Vermont that does it." I thank you for your very kind attention.

# FRUIT GROWING.

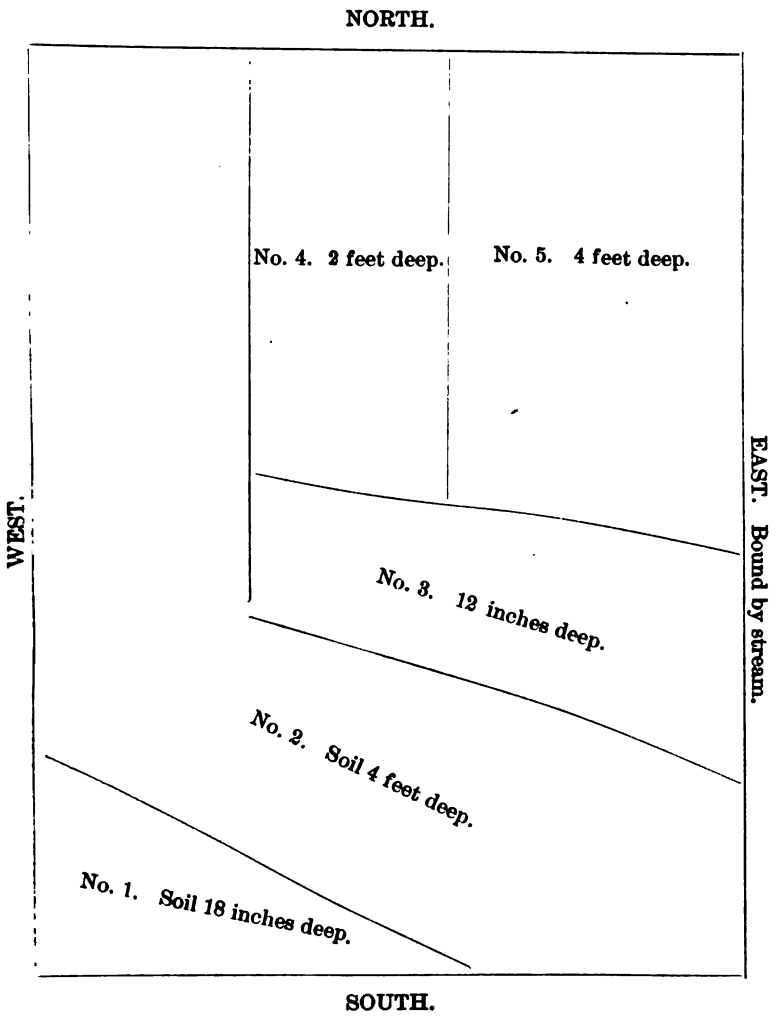
BY J. N. HARRIS, LUDLOW.

While the Board of Agriculture was holding a Farmers' Institute in Ludlow, the question was asked in the meeting: "What is the cause of railroad worms in apples?" The Board were not prepared to give any light on the subject, so I will give the results of my own experiments in my apple orchard during the past eighteen years.

In the first place, Vermont holds an average rank with other States as an apple growing State. Some parts of the State are very favorable to the apple family, without any great expenditure on the part of the farmer, while other parts are not adapted to the cultivation of apples. For instance, this part of the State lying east of the mountains, from the Summit to Cavendish, is very unfavorable. The growing seasons are short, and the soil is not composed of the right ingredients to meet the needs of the apple tree.

When I commenced cultivating my present farm, eighteen years ago, I selected for an orchard a piece of meadow land, the best (as I thought) that I had, well protected from west and north winds by a high bank, and bounded on the east side by a small stream.

I set out about two hundred young apple trees selected from nursery stock, but, like most nursery stock, they had received the treatment of stump grafting. In a year or two some of them died. An investigation showed that a kind of worm called wood borer had secreted itself in the joint where the grafting had been done. The tree in every case was sure to die. I discovered no way to prevent it. Of the remaining trees, some were soon checked in their growth, some made good growth for a while, and others continued to grow finely. I began to look for the cause of this uneven growth, and found that the ground I had selected had a gravelly bottom, with a sub-soil varying in depth from one to five feet. The following sketch will show the location of the various soil deposits:




In lot No. 1, the soil is only 18 inches deep, and here I set out Rhode Island Greenings. After three years' growth, the tap roots reached the gravelly bottom, and the growth of the trees was at once checked, and the fruit they bore was inferior in size and shape, and very wormy. In lots No. 2 and 5, where the soil is the deepest, the trees yield an abundance of fruit of good size and quality. The soil in lot No. 3 is so shallow that I lost nearly all

the trees; could not make them live. The surface of lot No. 4 is but two feet above the stream at low water mark. The water seldom flows over the surface, but the water rises and falls in this low place just as the water rises and falls in the stream, so there is an accumulation of iron and other minerals in this basin unfavorable to the growth of apple-trees. In this lot, the trees have not grown to the diameter of three inches during this long period.

Every farmer who attempts to raise apples should select good, warm, deep soil in which to plant his orchard. Good, marketable apples can not be grown on poor soil, any better than any other crop. Apple trees, to return perfect fruit, should be kept in a high state of health, and be vigorous and prolific in growth. Poor apples are sure to be the result from poor, unhealthy trees. Worms and other insects are sure to ravage this class of apples.

The soil where apple trees are set out should be deep enough to allow the tap roots to strike downward for their required nutriment. These roots are the life of the trees. But in my case, where the soil is shallow, I have used wood ashes freely on the surface in the fall. By feeding the roots nearest the surface I have obtained good results. Wood ashes are the best fertilizer that I know of for this practice, and the quality of the fruit can be greatly improved by using them.

The rough bark should be scraped from the trunks of the trees once in two or three years, so that the bark may be always smooth and healthy. To prevent the ravages of insects, the trees should be washed every spring with strong soap suds, to which a little kerosene oil has been added. This will prevent nearly all kinds of worms or millers from gathering on the trees, or coming near them.

In grafting trees, care should be taken not to graft upon trees that bear poor, inferior fruit in the natural state. Such scrubs, as I call them, should be destroyed at once. Many farmers make the mistake of grafting into too small limbs. The branch that is cut off where the scions are to be set should be at least one and a half or two inches in diameter, and the top of the tree should be well trimmed, not leaving more than two or three branches. By so doing the tree gives nearly its whole flow of sap to the scions, so that they, get a vigorous growth the first season. About the first of Sep-

tember the scions should be cut back, removing three or four buds at the top. This will insure safe wintering the first season. The remainder of the natural branches should be cut off the following spring.

Apples of almost any flavor may be obtained by care in grafting. For instance, the tartness of very sour varieties may be much modified by grafting into sweet trees. Sometimes apples grow ill-shaped, with sunken spots on one side, even if the apple is free from worms. This is frequently done by the wind or rain breaking off a leaf, or petal, from the blossom, before the fruit is fairly set.

The railroad worm does not exist in every locality, nor does he put in his appearance every year in the same orchard. He may destroy the fruit one year, and not be seen again for several years. The only remedy is to keep the trees in good health. As lice seldom live on a healthy, fat cow, or ox, so insect pests avoid healthy, vigorous trees.

In the trimming and pruning of fruit trees, the greatest care should be taken, both to do the work well, and to do it at the right season of the year. Many farmers, as well as others who own apple trees, do the trimming in the fall. This is a sad mistake. It must be borne in mind that with the ripening of the fruit, and the falling of the leaves, the flow of sap descends to the roots, and the tree is through making growth for that year. The tree practically sleeps in nature, until the return of spring, when the sap will flow up again to all parts of the tree. Therefore it is the best time to trim trees while the sap is flowing toward the wound to heal it, instead of receding from it, as is the case if the trimming is done in the fall. I prefer to trim and prune trees while they are in blossom, as the tree is then making its most vigorous growth, and the scars made by removing the branches will soon heal over; but in every case, the branch should be cut off as near the member from which it is taken as convenient, so that it may grow over as quickly as possible.

When trimming is done in the fall, the tree has not the life or power to heal the wound, so the newly-cut wood can do nothing but dry in towards the heart of the main trunk. It paralyzes the tree, and brings on early decay.

Fruit trees should be so trimmed that the top should be opened as much as possible, so that the sun may shine through among the branches. The rays of sunshine are a great factor in the development of perfect, fine-flavored fruit.

In conclusion, I would make special mention of the pear-tree. I have known trees that would make rapid growth, without producing any fruit. In such cases, the roots are making too rapid growth. The main roots should have the earth removed from them, and then be cut off three or four feet from the trunk. Then pack some old scraps of iron, and old bones, around the roots, cover them up, and pack the soil down firmly again. All who try this, will be surprised with their crop of pears.

ON THE UPPER CONNECTICUT.

# VERMONT AT THE WORLD'S FAIR.

*By H. H. McIntyre.*

Vermonters have borne a reputation, perhaps not undeservedly, for "keeping an eye to the main chance," and for a careful conservatism in expenditures, amounting sometimes, it may be, to what would be regarded as penuriousness in communities where riches are easily won. But their stubborn hillsides do not readily yield their wealth, and hard earning begets close holding. It was but natural that their legislators should inquire, when asked to appropriate for a World's Fair in Chicago, "How will it profit Vermont?" and to demand that a material benefit should be made apparent before voting the sum required for her share in the enterprise. It was this same cautiousness, and not the preponderance of farmers in the Assembly, which led these legislators to try to insure a wise expenditure of the fund appropriated, by providing that her leading industry, agriculture, should receive the major part of the money and the first consideration at the hands of her Commissioners.

Along with this caution, however, and modifying it, Vermonters are endowed with a state pride born of the state's illustrious history in connection with early events in our national existence, no less intense and sturdily maintained than that of Massachusetts or Connecticut. When, therefore, it was demonstrated that not only pecuniary profit, but also good fellowship with sister states, demanded liberality for the purposes of the Exposition, the required sum was voted with good grace and as abundantly, in proportion to wealth and population, as the most sanguine could ask. The first appropriation, made in 1890, the first made by any state, was based upon the amount found necessary at the Centennial Exposition of 1876,—five thousand dollars for all purposes. It was soon discovered, however, that the Exposition of 1893 was planned on

a very broad basis, and that purses must be very widely opened before its conclusion. This small sum was accordingly tripled by the special session of 1891, and again doubled by the Legislature of 1892, making a total of about $30,000 intrusted to the Commission of nine members created by the act. Here a mistake was made. The Commission should have been larger, in order to secure a wider interest in all parts of the state in the different industries, and also to enlarge the chance of including in its make-up the one man whose genius should give form and color to the undertaking, and give at the start the premonition of success, without which success is often wanting. World's Fair managers are born, not made. The opportunities for the special education and experience necessary for making them are too rare. The personnel of the Vermont Commission was specifically defined by law. It comprised the governor of the state, *ex officio*, the two national Commissioners and their alternates, and the two Lady Managers and their alternates, nine in all, embracing a practical working force of only two or three members. This is said without the least intention of conveying the idea that the Lady Managers did not manage. He would be a bold, bad man who would even hint that the Exposition would have been the unrivalled success it was, or that the business of state boards could have been properly conducted without them.

Notwithstanding the infrequency of universal expositions, and the limited number so far held, they have already worn for themselves certain ruts in which, it seems, they must move. One of the deepest of these is the obligation of each state and country to build a house within the fair ground, to be known as "the building" of the commonwealth or government to which it belongs. The design and construction of this house was one of the most difficult problems confronting the State World's Fair Boards of 1893. On the one hand, the Exposition architects were insisting that all the buildings should be designed in classic mould, with the elimination of everything crude, or grotesque, or even unique, if it differed greatly from approved forms; and on the other hand, "leading citizens" demanded that some historic structure should

THE VERMONT STATE BUILDING.

be reproduced, or some building representative of the state's character or leading industry be adopted. The Exposition architects won the battle in nearly every instance, because they were right, and the result was most gratifying to all but the "leading citizen."

It was the early expectation of the Vermont Commission that their state building would be chiefly of stone, marble, granite, and slate, and designs were prepared to this end; but labor troubles, business depression, and possibly a degree of apathy on the part of quarry owners, made their plans nugatory. Nearly up to the end of 1892, no appropriation had been made by the state for a building, and the fund of ten thousand dollars guaranteed by one hundred good citizens of the state was far too small to warrant any very expensive undertaking. It was estimated that no creditable stone building could be erected for less than $25,000 or $30,000. After the appropriation was assured, it was already too late. The guaranteed fund lapsed by reason of the appropriation, and left the sum still too small for any but a cheap building. If the Legislature had done promptly what it did tardily, the result would have been a stone building, and universal satisfaction. The design, however, of the Pompeiian villa to be erected in stone, drawn by Mr. Jarvis Hunt, of Weathersfield, seemed, on the whole, to embrace more good points than any other offered for the wood and staff material to be used in lieu of stone, and, being highly approved by the supervising architect and his corps of assistants, its construction was arranged for and begun late in the fall of 1892. The hesitation and delay were very unfortunate, for Massachusetts, with her usual promptitude, had taken the lot assigned to her, adjacent to Vermont's, and terraced it up four or five feet high, to the certain dwarfing of any building placed contiguous to hers on the street grade. On the other side, Maine had encroached with some of the outriders of her tall, octagonal building fairly across Vermont's border. The one-story villa was, therefore, almost hidden by its surroundings. One possessing artistic culture could only say, "It is a pity so pretty a building could not have had a place apart from others," while the uncultured called it "a hen-coop."

One correspondent holds up his hands after the manner of Sergeant Buzfuz, and exclaims, "Vermont and Pompeii! Did you ever! And palms!"—as if the Catamount Tavern at Bennington, Vermont, which he wanted reproduced, was not crudely modelled after forms born in Attic brains twenty-five centuries ago, or as if even the suggestion of sunny skies and balmy breezes were to be forever denied to Vermonters! Another, a Vermonter born, whose milk of human kindness had curdled in Kansas thunderstorms, said to Superintendent Drew, "Wal, Vermont don't seem to spread out very big beside some of 'em?" "No," replied Drew, "but the building isn't finished yet." "Not finished? What more is to be done?" "Oh, we intend to paper the walls of the large room with defaulted Western securities held by our people, as soon as we can get paste enough made."

The building cost $10,000, exclusive of marble floor tiles, ornamental painting, fountain, electric light fixtures, etc., which added some $2,000 more. The expense of building, or doing anything else about the Fair grounds, was double what it would have cost to accomplish the same elsewhere. The people of Vermont were disappointed that the quarry owners did not combine and construct the building of their products. If they had forseen how prominently it would be placed, and how constantly it would be frequented and studied by all visitors, it is quite certain they would not have allowed this best of all opportunities to advertise to pass unused. It was a pity to throw away the best chance in the world to make the famous quarries of the Green Mountains the most noted of all. It was unfortunate, too, that the buildings of the small states must be placed on the same avenue and contiguous to those of the larger ones. A house that costs five thousand dollars is out of place, dwarfed and insignificant when erected beside one worth ten times as much, while it would look dignified and perhaps aristocratic if built in a row of humble cottages. Three or four of the New England states should have smothered state pride and combined and erected one structure for all; for while in intellect, moral worth, education, or any of the higher attributes of man, they can hold place with the proudest, they are handicapped

in an exhibit of material wealth, and ought to have been wiser than to enter a race in this field on equal terms with richer neighbors.

Notwithstanding its bad location and deficiencies, however, the Pompeiian villa, when all is said, well served the purpose for which it was erected. It afforded a rendezvous for the people of the state and their thousands of Vermont-born kindred living beyond the borders, and a comfortable resting place for other thousands of weary sight-seers. More than eighteen thousand persons, nearly all Vermonters, availed themselves of its hospitality and wrote their names in its register, besides an unnumbered throng which passed through its portals and left no sign.

Vermont's proudest characteristics could find no fitting or adequate representation at a World's Fair, and were left at home. Vermont is a state rich in patriotic achievement, replete with brave, historic incident. Her annals are spread with many a page of priceless worth to her citizens; but her children wish to blazon her triumphs to the world in new deeds. The Commission considered and rejected a proposal to illuminate the facade of the building with the decision of Judge Theophilus Harrington, in 1809, when the slave-owner proffered a bill of sale in proof of title to his human chattel: "Only a bill of sale from God Almighty will serve to hold a slave before this court"; and this from Gen. John Burgoyne's letter in 1777: "The New Hampshire Grants, peopled by the most rebellious and warlike race on the continent, hangs like a war-cloud on my left"; and the liberty-breathing words from the state Constitution, adopted at a time when liberty was treason: "All power is derived from the people, therefore all officers are their servants." "No person ought to be held by any other person as a slave,"—all illustrative of that spirit of self-reliance and personal independence which is at the foundation of the good government of our beloved state, but which cannot well find expression as an exposition exhibit.

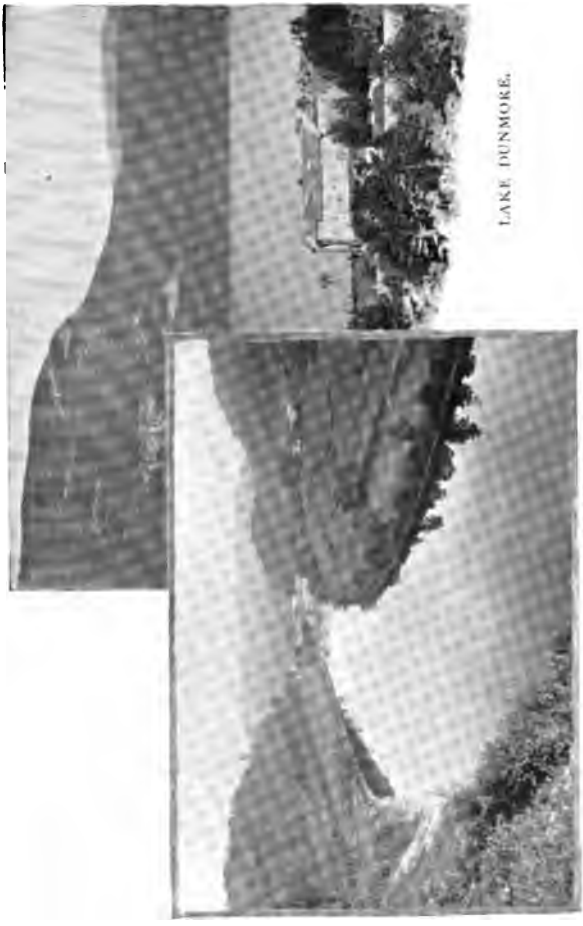
Another feature that can be seen only where is has been everlastingly placed in Vermont is her natural scenery. This cannot be unrolled, even from the most artistic canvas, without despoiling

its beauty. Its bloom is as delicate as the tracings of the dawn, and must be seen with its every accessory as nature has placed it. Of course the Fair was incompete without it, but the omission was unavoidable.

Vermont is rich in the boundless possibilities of her stubborn soil, and fairly well to do in the wealth already wrested from it. Agriculture is her chief reliance, and her sons are strong-handed, clear-headed husbandmen, who recognize the importance of producing the best, and advertising to the world what they produce. It is true that the number of farms in the State has diminished within a few years, and the farming population has decreased. Many rugged hillsides were formerly cleared and tilled which should have been left forest clad. Such farms are now being merged in the better ones adjoining them. The fertile ones are better cultivated and more intelligently managed than ever before, and the change induced by railroads, farm machinery, and better education, is constantly affecting rural as well as urban life,—but always for the better and not, as abandoned farm pessimists and calamity howlers would have us believe, for the worse.

Vermont's most valuable industries at the present time are the breeding of Morgan horses, Jersey cattle, and Merino sheep, and the manufacture of butter and maple sugar. These pursuits occupy the attention of the large majority of her farmers, and the steady improvement in the appearance of the trim villages dotting the valleys, the snug farm buildings, and the growing savings-bank deposits, attest how successfully their calling is followed. It was with a view to further increase their wealth that the farmers in the Legislature enacted concerning the World's Fair fund, that "in expending such appropriation preference shall be given to expenditures in aid of the exhibition of agricultural products." This injunction was faithfully observed by the Commission, and steps were taken to secure exhibits in accordance therewith.

The Morgan horse breeders are not unreasonably proud of their animals. The breed originated in Vermont a hundred years ago, but may be traced back, it is said, through its most famous progenitor, Justin Morgan, to the best Arabian stock, which it still



LAKE DUNMORE.

FROM PHOTOS BY G. W. PERRY.

THE WINOOSKI RIVER, NEAR MIDDLESEX.

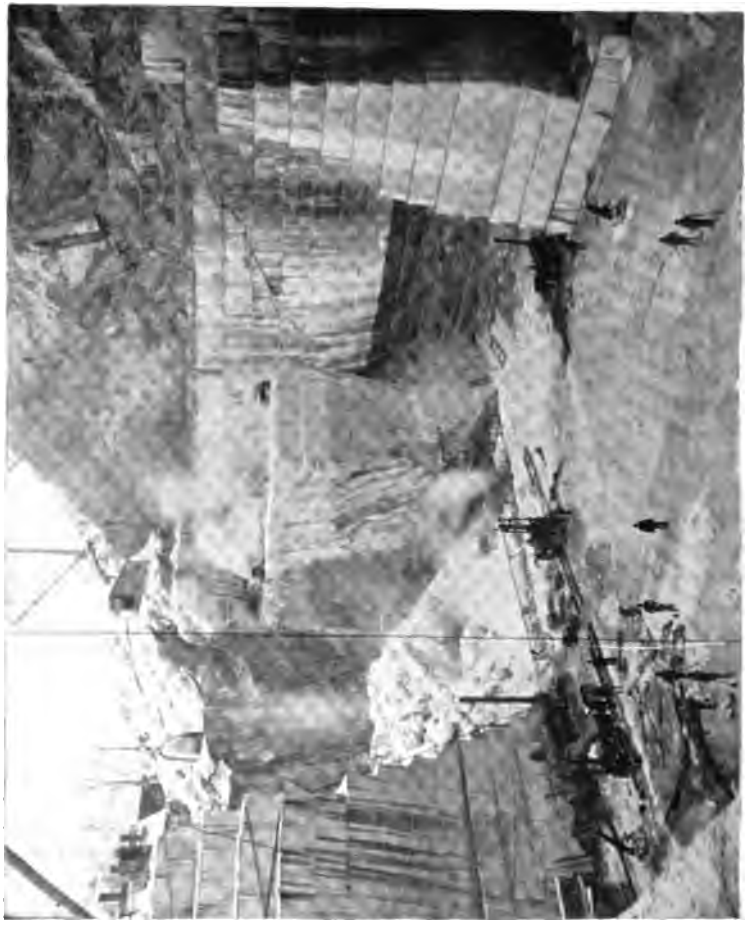
strongly resembles. It is well adapted, by its pronounced characteristics of compactness and endurance, for the laborious farm and road work exacted from it at home; while its speed, spirit, and good style make it unsurpassed for carriage or pleasure driving. It is conceded that in a vigorous climate, animal as well as vegetable life does not attain the generous size reached in milder regions, but its lack in this respect is more than counterbalanced by strength, vigor, and endurance. Carriage horses brought from a Green Mountain farm, accustomed to the rough usage and inattention usually bestowed upon them through their early years, will respond to good care in city stables far better than those whose hothouse growth has been forced at the expense of vitality. The good qualities of the Morgan horses are recognized by Kentucky, Indiana, and Illinois breeders, as well as in Vermont; and the thirty-five horses shown by Vermont at the Exposition met in sharp competition their cousins from the Western states. Both parties claimed highest honors, and both received them, while lovers of good horses could well be happy with either, were the other away. The stud of Hon. Joseph Battell of Middlebury, Vt., took the largest number of premiums, and well deserved the distinction. The public attention drawn by the Exposition to this breed of horses is alone believed to be worth the whole cost of the state's exhibit; but the definite value of this or any other exhibit is incomputable in dollars and cents. The horse exhibit was made under the auspices of the Vermont Horse Breeders' Association, in the management of H. T. Cutts of Orwell, Vt. It cost about $2,500, of which $1,800 was paid from State funds, and the balance from the premiums, amounting to about $1,000, received from the Exposition Company.

Nature has done everything for the Vermont dairymen that could be asked. She has given them sweet grasses, good water, and pure air. If the cows are comfortably housed against inclement weather and given free access to these, only faulty manipulation, for which neither nature nor the cow is to blame, can spoil the butter. The industry is a large and growing one, and improvements in methods have kept pace with its growth. The

Vermont Dairymen's Association, the State Experiment Station, the Vermont Farm Machine Company, the weekly press, and the common schools have all been active agents for several years past in teaching farmers how to secure due advantage from nature's beneficence, and how to avoid making the unskilful swear and the judicious grieve by undoing her good work. Knowing that this teaching has not been in vain, and that no better butter can be made under the shadow of Dutch windmill or beneath the summer clouds that hover over our Central States than is produced from these hillsides, the Commission set about the task of proving the fact to the world in a competitive test. That we should win we had no doubt; that we have won we feel quite sure, not only in the highest score for an individual lot, but in the highest average for the entire exhibit in the dairy class, exclusive of creamery or factory made butter. In making up Vermont's exhibit, every sample and package offered was accepted and placed on exhibition. The test was, therefore, fairly indicative of the quality of all Vermont butter, and is worth many-fold its cost of $1,200, by informing consumers of the fact, already known to dealers, that the brand "Vermont," applied to butter packages, is synonymous with excellence, purity without strength, color without carrots. It is particularly gratifying to the proprietors of the beautiful herd of Jerseys on the Green Mountain Stock Farm, nestling in the picturesque and fertile valley of West Randolph, to have the judgment of the experts which gave them the highest award on butter at the Paris Exposition of 1890, confirmed by the best score at Chicago in 1893. Good butter is always in demand at a price remunerative to the producer, and needs no protection through sumptuary laws against its oleaginous and aspiring rival of compound name and nature, the by-product of our slaughter houses.

The census of 1870 credited Vermont with 175,000 milch cows, while in 1890 there were 231,000, notwithstanding abandoned farms, oleomargarine, and increasing competition from the Western Central States.

In extolling the excellence of Vermont's dairy products, it must not be forgotten that much is due to her superior breed of dairy



MARBLE QUARRY AT PROCTOR.

cattle. She cannot, of course, lay claim to originating this breed, whose home is in the rugged Jerseys; but it is confidently asserted that the breed has gained rather than lost in the good qualities for which it is noted by change of climate and the generous feeding for which our stock breeders have gained reputation. It has not suffered, as was predicted by the Jerseymen, by removal from the isolation of its island fastness and the propinquity of other and less famous herds. The crossing of best strains of blood, careful inbreeding only to the point where its benefits are counterbalanced by hereditary defects, and accurate records of results, are as closely watched and followed in this country as in England, and with equal advantage.

The possession of such cattle and knowledge of their worth induced the State to arrange and pay for an exhibit at Chicago. About twenty-five head were sent, chiefly from the farm of the late Frederick Billings of Woodstock. These met a large number, aggregating several hundred, from all parts of the country, and came off with no second honors. Among them was the young cow "Lily Garfield," less than two years old. She was entered in the twenty-one days test, in competition with thirteen others, and took the highest award. She produced in the time five hundred and sixty-three pounds of milk, which made twenty-nine pounds of butter. Such an animal as this in a community of butter makers, where the best breed and the best strain of blood in such breed are made a careful study and a matter of practical business application, soon raises the aggregate good qualities of all by her own progeny and that of her kindred, inferior animals being disposed of to make room for the better ones. Ingersoll pithily says of the human kind: "A great man is a mountain, with a valley of ancestry on one side and a depression of posterity on the other." The ancestry and posterity of our domestic animals under intelligent husbandry are neither valley nor depression, as compared with notable individuals next of kin. Competitive examinations and tests are the measures by which the relative superiority of this or that herd is established, and their cost is but a bagatelle compared with the advantages derived.

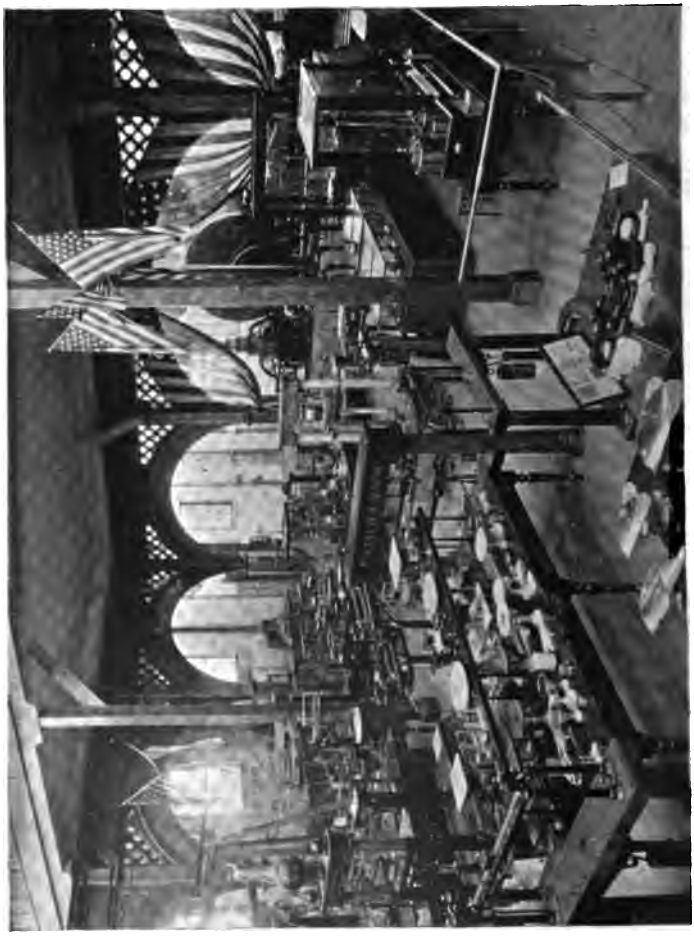
The farmer lives of necessity an isolated life. His occupation closely absorbs his time and attention, and he has little opportunity to observe what others are doing in his line. It is only when some notable occasion, as a fair or political meeting, calls him out that he compares his own possessions with those of others,—at the former his material belongings, at the later his mental equipment. Still better for him is the wider opportunity afforded by a World's Fair, when the comparison extends beyond his immediate vicinity, and brings within his knowledge and grasp what he might otherwise never have attained.

THE VERMONT MARBLE COMPANY'S EXHIBIT.

The logical conclusion of one who finds himself excellent in his own calling is, that he might have done better. This and the stimulus of competition are powerful incentives to improvement, and exert a more subtile and widespread influence than can be estimated. Numerals are useless in computing the benefit derived from such an exhibition as that of 1893. How much of future progress may be ascribable to its influence will never be known; but no sane man doubts that the twenty or thirty million dollars expended in its preparation, and the many more millions lavished in visiting and examining it, are "hostages to fortune" which will be redeemed with interest many times compounded.

Unlike the improvident hunter, whose bow with one string failed him at the critical moment, the Vermont dairyman is doubly provided against possible disaster. If his herd of Jerseys proves unremunerative, he can stock his farm from his neighbors' Ayrshires, and his head with a little more of the lore of his craft, with the certainty of doing well. The State exhibit of Ayrshire stock was drawn from the herds of C. M. Winslow of Brandon, and L. S. Drew of Burlington, and comprised twenty-five animals. These, as well as the Jerseys, encountered strong competition, two or three hundred head being shown in each class. It is claimed that they fell a victim to a vicious "one judge system." It is asserted that a provincial foreign judge, who was not even a breeder of Ayrshires, unchecked by any board of appeal or other supervisory power,—for none existed under this Utopian system,—set up a standard of color and shape of horns which would include only the animals from his own country, and, ignoring well-shaped udders, large milk veins, and other indications of superiority included in the standard schedule of "points" peculiar to the breed, as formulated by expert breeders, placed his judgment where it would do the most good,—at home. This assertion may be ill-grounded and wrong; but a system under which it could be made, with no possible chance of redress in case it were true, is surely faulty and to be condemned. The Ayrshire premiums went chiefly to the Canadian cattle, and American breeders felt aggrieved.

Whatever the effect which may hereafter follow from a "revenue tariff," it can hardly be claimed by our Vermont sheep breeders that, up to this time, the decadence of their industry has resulted from adverse legislation, or that the present depression of the business, growing out of the low price of wool and stagnant demand for well-bred sheep, is attributable to causes within the control of legislators. These conditions simply prove that some other sections of our country or some other parts of the world are better adapted for sheep husbandry than our own. The decline in the number of Vermont sheep, from 580,000 in 1870 to 334,000 in 1890, and the fall in the price of wool within the same



FAIRBANKS & CO.'S EXHIBIT.

time from sixty or seventy to fifteen or twenty cents per pound, with a corresponding increase in the number of cows and price of dairy products, point to the conclusion which every well-balanced farmer should accept with equanimity. Instead of laying the blame upon legislators and laws, he should place it, if fault there be, at the door of nature and the course of human progress, and "trim his sails to meet the veering breeze."

Our sheep breeders, however, like the dark members of their flocks, are "dyed in the wool," and do not propose to lose any opportunity to better their condition. They

> "Will not from the helm to sit and weep,
> But hold the course, though the rough winds say no."

They assembled nearly one hundred pure bred Merinos from twenty different flocks, guaranteed the expenses of taking them to the Exposition, and showed their brethren of the world that pecuniary discouragements only lead to the more careful selection and handling of their animals. It is true, these are descended from illustrious ancestors. Some of them claim in their pedigree such famous dams as Hammond's "Queen," and sires like "Gold Drop." It is not expected that the sheep and wool exhibit will enhance the price per pound of Merino fleeces; but there can be no doubt that it will increase their average weight throughout the world. Intelligent breeding has added within twenty years more that twenty-five per cent. to the average fleece in Vermont, according to the census reports of 1890, and the Merinos thus improved are now on sale in a score of our farmyards at a price within the reach of thrifty ranchmen.

An impression prevails among producers of high-grade Vermont maple sugar that consumers need education. They believe that the relative quantity of fabricated, spurious, adulterated, and low-grade goods put upon the market in this line is so great in comparison with the pure and good, that the majority of maple sugar users have set up a false standard of excellence by reason of total ignorance of the better article. It was with a view to correct this error that a special effort was made by the Commission and the

Sugar Producers' Association to place an attractive and instructive exhibit of this product at the Exposition. A pavilion was built by the State in the gallery of the Department of Agriculture, at a cost of $1,500, filled with the finest sugar obtainable, and placed in charge of Mr. C. D. Whitman of Brattleboro, Manager of the Vermont Maple Sugar Exchange. In addition to this, Mr. Whitman, knowing that however much the eye may be delighted with the soft-glowing colors of a fine syrup, the palate is, after all, the supreme judge and arbiter in the matter, obtained a "concession" and sold pancakes and syrup. If the Frenchman in the model bakery on the opposite side of the street thought the taste of Mr. Whitman's constant throng of customers, who turned their backs on French baking, crude and unappreciative of *bons morceaux*, he, too, needed education, and got it, perhaps before the season ended. The syrup of W. R. Dean, of Manchester Center, was selected by the expert judge in this class of goods as the perfect standard by which others should be judged. Mr. Dean may well be satisfied with the distinction among so many exhibitors, whether his medal bears Jove's thunderbolt, or cap and bells. Sugar making is a branch of Vermont farming that pays, though it is not followed, as the energetic Englishman suggested it should be, if profitable, the year round. It is pursued at a season when the farmer is comparatively at leisure, and his sugar orchards occupy land unfit, as a rule, for tillage. The State's average annual product of twenty million pounds cuts a small figure, it is true, in the sugar markets of the world; yet the creation of a demand for a genuine article of luxury, and an advance in price of a single cent per pound as the result of judicious advertising, mean a little more income and possible comforts in the homes of thousands of honest, industrious toilers, whose daily necessities gall the heel of daily earnings.

While speaking of a gallery exhibit, it is not amiss to notify designers of future exposition buildings that future exhibitors in this generation will not occupy galleries. The space at their disposal must be on ground floors, all equally accessible to visitors. It seems within bounds to say that not one-fourth of the millions who entered Jackson Park in 1893 troubled themselves to climb

gallery stairs. The fact that some of the finest exhibits were in the galleries did not move them. There was enough to be seen on lower floors, and it was weary work.

Stone quarrying and other allied branches of mining industry form a theme that always incites interest. The dragging of hidden wealth from the reluctant earth seems to inspire a fascination unfelt by toilers in beaten paths, due, perhaps, to the element of uncertainty that enters into it. So we turn with pleasure to the sources of wealth which we are sure lie within reach just below the surface of our hills, and, to the discomfort of our husbandmen and their grazing herds, sometimes too near the surface.

THE MORGAN STALLION "DENNING ALLEN," WINNER OF FIRST PREMIUM AT THE WORLD'S FAIR, 1893.

OWNED BY HON. JOSEPH BATTELL.

I have already alluded to the disappointment of the Green Mountainers that their magnificent quarries of marble, slate, and granite did not contribute stone for the State building. The quarry owners simply failed in the concerted action necessary to bring this about ; for they placed less conspicuously in the Manufactures Department individual exhibits quite as expensive to them

as the prominent State building would have been, after deducting from the whole cost the sum the Commission would have gladly added to their resources. The Vermont Marble Company, of Proctor, occupied an excellent location at the north end of the Manufacturers Building, and filled it as attractively as could be done with "dull, cold marble." They had monumental work; building stone deftly fashioned in rock face and cut face, mosaic and plain; marble squirrels, marble birds, and a serpent crawling through a solid block of marble of which it made a component part, realistic enough to have provoked a dialogue with any unsophicated Eve who came that way without her Adam. Their exhibits covered a thousand square feet of floor space, and cost $10,000. Adjacent to the marble, the Barre Manufacturing Company, a combination of producers formed for the express purpose of making an exhibit, set up a line of their work. Their exhibit also cost several thousand dollars, and but feebly set forth the many uses to which this stone, so abundant, varied, and excellent in Vermont, may be put. It fell far short of what it might and ought to have been from the resources at command. These commercial ventures were supplemented by an exhibit in the Department of Mines, of nearly eighty samples from as many different quarries of granite, marble, and slate, mostly in the form of eight-inch cubes. A study of these would convince the most skeptical that a fabulous wealth of this material is only awaiting development, and confirm the glowing statements of the expert judge who examined and reported upon the exhibit.

The exhibits of manufacturers are of no less concern to themselves than to the communities in which they are located. Corporations are soulless only when their managers are soulless. Our two most successful establishments in Vermont, the Fairbanks Scale Company of St. Johnsbury, and the Estey Organ Company of Brattleboro, both acknowledged their duty to the hundreds dependent on them, and appeared in good form at the Exposition. The Scale Company completely filled six thousand three hundred square feet of floor space in the Manufactures Department, and showed nearly three hundred different scales or parts of scales, to

weigh leviathan or an atom, or to so equip old Justice herself that her blinders may be removed to the advantage of us all. The exhibit was one of the largest and most complete ever made by a single manufactory, and cost more than ten thousand dollars. Will not St. Johnsbury, and Vermont, and the whole world profit from this display, as well as the men whose name the corporation bears?

The Esteys of Brattleboro are known wherever "concord of sweet sounds" unfits men "for treason, stratagems, and spoils." Their exhibit of musical instruments was located unenviously in the midsts of rivals, and took the share of honors due to modest worth. The very unique exhibit by Gov. Levi K. Fuller, of the

THE MAPLE SUGAR EXHIBIT.

Estey Organ Company, of more than three hundred tuning-forks collected by him in all parts of the world, attracted much attention from musicians. It included the oldest tuning-fork in existence, made by the inventor, John Shore, in 1714; and also the forks used by Handel in 1749, that of Sir Michael Costa, and all of those forks which have controlled musical pitch since 1714. The collection is the result of more than twenty years' study and investigation by Gov. Fuller in this direction, and has culminated in the adoption, largely through his efforts, of a standard international

pitch for all musical instruments, represented by that key of A which gives four hundred and thirty-five double vibrations per second.

The Vermont Farm Machine Company was among the unfortunate exhibitors whose goods were installed in a gallery space. They made an extensive showing of those implements of their manufacture, now as indispensable in the dairy as the typewriter is in the business office or the reaper in the wheat-field, and deserve the success their energy and perseverance have brought them.

Many lesser exhibits from the State are entitled to special mention. One of these is the honorable roll of one hundred names of good citizens who guaranteed that the State should be represented at the Exposition, whether or not an appropriation was made.

Another, and a phenomenally unique and attractive exhibit made by the Commission, not shown at the Exposition, is a remainder of about $3,000 from the World's Fair appropriation, to be returned to the State treasury. The Commission has faithfully tried to serve all classes, giving assistance to such exhibitors as asked for it; creating a rendezvous at the Fair for Vermonters and their friends; effectively advertising the State's leading industries; and ending with a balance of funds to be returned to the treasury for those who stayed at home. Surely it could not have done more.

# VERMONT.

A GLIMPSE OF ITS SCENERY AND INDUSTRY, BY VICTOR I. SPEAR.

"'Tis a rough land of rock and stone and tree,
Where breathes no castled lord nor cabined slave,
Where thoughts and hands and tongues are free,
And friends will find a welcome, foes a grave."

## INTRODUCTORY.

The only excuse offered for the preparation of these pages is the belief that Vermont has a history and tradition which it is an inspiration to study, and present advantages and attractions which commend it to either the business man, the seeker of a home, or the tourist. An attempt has been made to call attention, by illustration and description, to a few of the prominent facts and features of the State. The illustrations are all made from photographs, and are as correct as it was possible to obtain. The descriptive matter has been prepared with care, and is believed to be reasonably accurate. It is hoped and expected that many of the quarter of a million native Vermonters now living in other States will take an interest in the work, and if it is found that in the twenty or fifty years since leaving the State some things have changed, that business is now being done in a different way, that new industries have sprung up, that the manner of living has changed, and that the Vermont of the present seems unnatural, they are assured that many things remain the same. The streams have neither changed their courses nor lost their beauty. The mountains retain the same rugged and interesting outlines. The hills have lost none of their former freshness, nor the valleys their

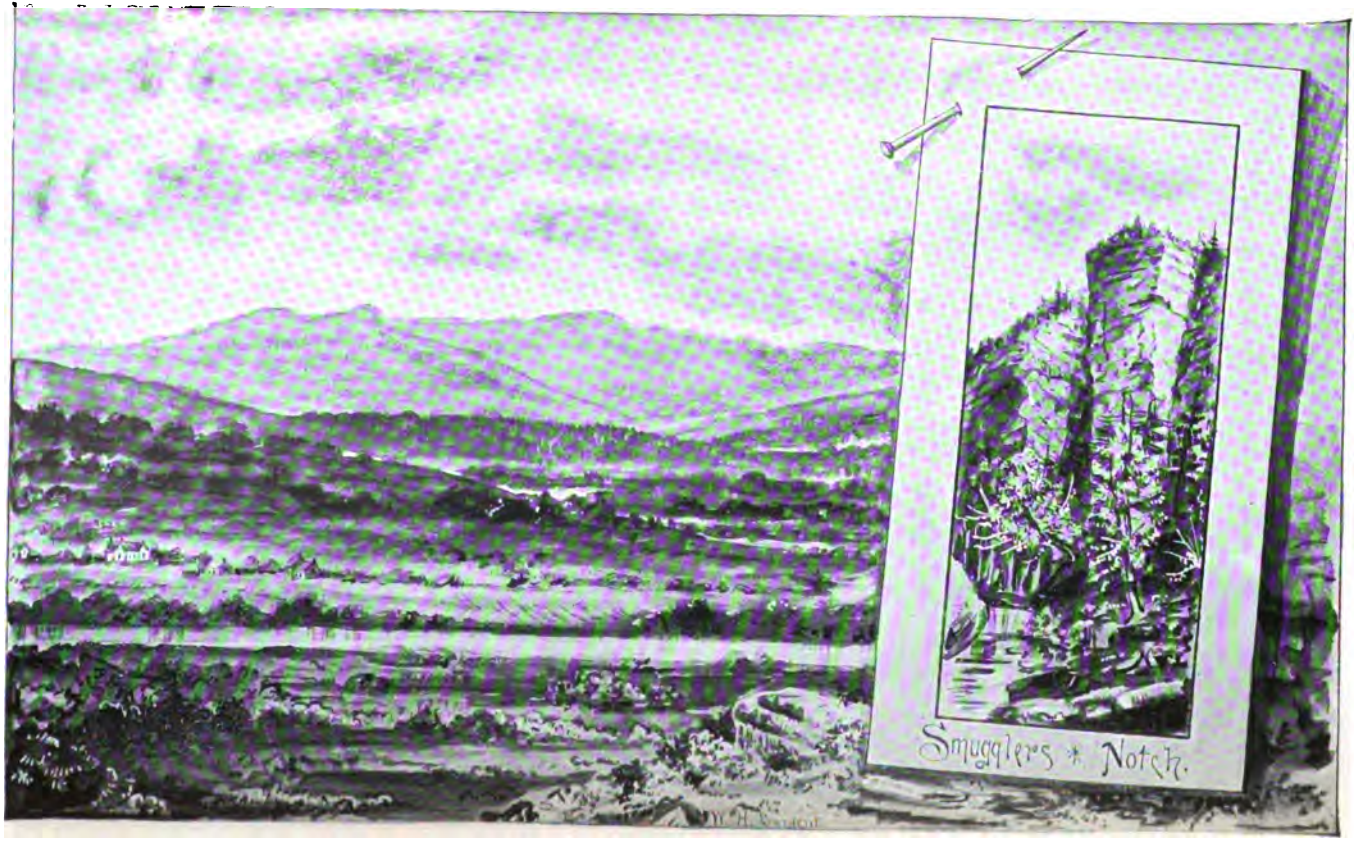
WINDSOR HOUSE NEAR MONTPELIER.

peculiar charm. The water is as pure and sparkling, the air still laden with health and vigor, the winters as cold and the summers as delightful as ever, and will all seem to give a welcome greeting to those who have once known them.

Though there may be some truth as applied to the State, in the humorous statement of a recent writer as to a certain Vermont town, "That the advance in modern civilization has done away with many of the peculiarities of the early days, and the people are getting to be no better than their lowland neighbors, who therefore no longer despise them," it is nevertheless true that the Vermonter of to-day retains many of the characteristics of the early days, and this will never disappear until the physical conditions of a State ceases to leave their imprint on its people.

## HISTORICAL.

Though it is not intended to dwell upon matters of history, there are certain periods and events in the past to which Vermonters always refer with justifiable pride, and a reference to which may help to a better understanding of the present. The first struggle of the early settlers with the forests that covered the country was quickly followed by a contest with the people of the adjoining territory, who undertook to get from them the lands that they had bought and improved. The resistance on the part of the settlers, under the able leadership of Allen, Warner and Baker, comprises a period of history possessed of romantic interest. The part taken by these same men a few years later in the War of the Revolution, in which they bore a conspicuous part, and fought valiantly for the independence of the colonies, not knowing whether success in their efforts was to be to them an advantage or a loss, was an exhibition of faith in the final triumph of right and justice, which has seldom, if ever, been equaled. The wise course of Governor Chittenden, in so managing affairs as to bring out of this conflict an independent commonwealth, which was later admitted to all the rights of statehood, deserves all the words




MT. MANSFIELD AND SMUGGLER'S NOTCH.

of praise that have ever been bestowed upon it. The present generation cannot over-estimate the debt that is owed to the pioneers, nor too often recall the sacrifice made in behalf of what seemed to them right and just. The motive and the conflict are well expressed in the following lines:

"Fierce was thy long campaign
For liberty, to gain
A sure repose;
Thy banner wide unfurled,
Thou didst 'defy the world,'
And thy stout weapons hurled
'Gainst all thy foes."

One of the first victories of the Revolution was won by Ethan Allen and the Green Mountain boys at Ticonderoga. The first blood shed in that contest was the blood of a Vermonter, William French, at Westminster. On the fields of Hubbardton and Bennington, Vermonters bore a distinguished part. Later, at Plattsburgh, it was shown that the qualities of Vermonters were unchanged, and still later, in the great national contest, it turned out that no State furnished so large a proportion of its citizens in defence of the country, as Vermont. To its credit and sorrow it is recorded that no State lost so large a proportion of its sons in battle as Vermont.

The first soil broken for a Union intrenchment was by Vermonters. The first charge made upon a rebel fortification was by Vermonters, and in the closing act of that bloody drama, when the Union troops marched through the Confederates' capital, Vermont soldiers were at the head of the column. Well might the gallant Sedgwick give his memorable order, "Put the Vermonters ahead, and keep the column well closed up." From Bull Run to Appomatox there was no failure of the Vermont troops to respond to every call. And of all the battle flags borne by Vermont regiments, no one of them ever became the possession of the enemy, but all were returned in triumph to the custody of the State.

It appears that the original plan of colonization did not contemplate any separate organization or State of the territory com-

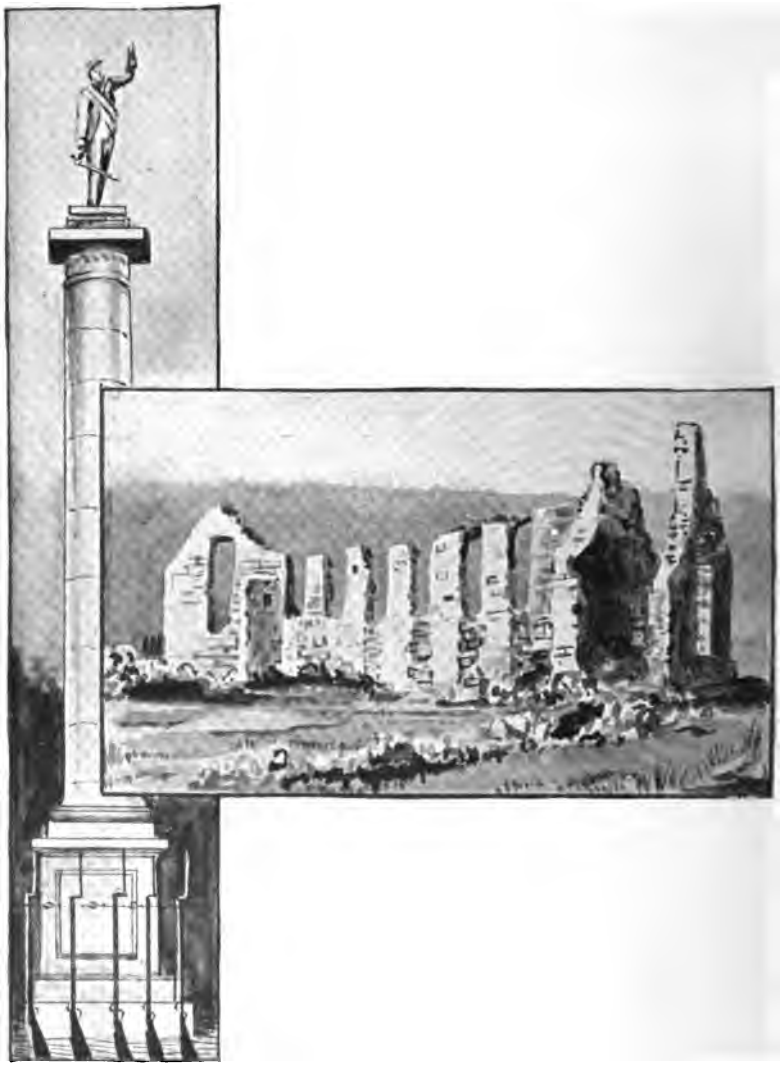
LAKE DUNMORE.

prising Vermont, but the conflict of claims on the part of New York, New Hampshire and Massachusetts to this territory, resulted in making it an independent State, and the record made by the people of Vermont has justified its existence. Though small in area, and traversed by mountains, having considerable of its 10,000 square miles unfitted for agricultural purposes, it has always preserved its place at or near the head of the column in all matters of development and improvement. And though from its small area it might easily be overlooked on the map of the United States, it is always prominent when one studies either the political, social, educational, or industrial condition of the country, and the imprint, Vermont, so often found, is always in connection with the best that has been accomplished.

## EARLY INDUSTRIES.

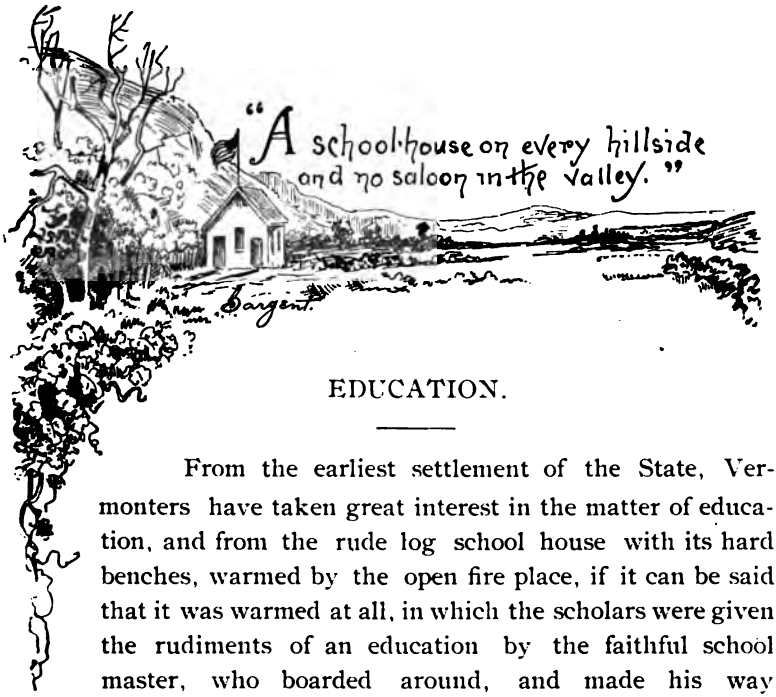
No one living to-day can tell the story of Vermont from the beginning, for it is already far into the second century of its existence. Few now living can give personal knowledge of the industries of the State, and the manner of living in early times. The first work of the people, the felling of the trees that covered this territory, the burning of the logs to charcoal and ashes to be used as commodities of commerce, the clearing of the land and making it ready for the harrow and the crop of wheat, the slow and laborious process of removing the stones and stumps and making tillable fields, represents an amount of hard, untiring labor, which the present generation know nothing of, except as it is told by the oldest citizen, or learned from books.

While the farmer in early times was depending upon the sale of charcoal, potash, wheat and potatoes for his principal income, the wife was utilizing the other products of the land, and was spinning the flax and wool which the farmer had raised, and with loom converting it into cloth, to supply the necessities of the household. Busy and toilsome were the days of the pioneers, and



TICONDEROGA AND ETHAN ALLEN MONUMENT

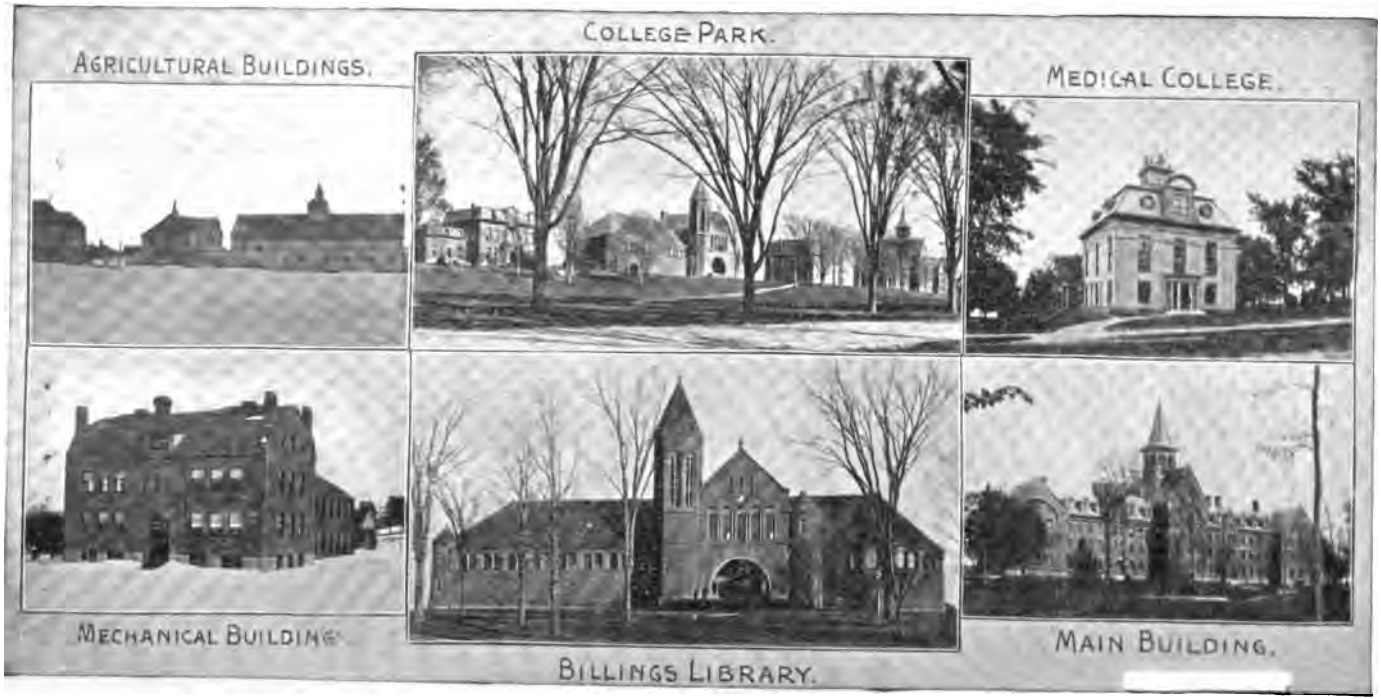
often the day's work extended far into the night. Meagre were the returns for this labor, but sufficient to raise up and provide for large families, which seldom lacked the necessities or knew the luxuries of life.




## EDUCATION.

From the earliest settlement of the State, Vermonters have taken great interest in the matter of education, and from the rude log school house with its hard benches, warmed by the open fire place, if it can be said that it was warmed at all, in which the scholars were given the rudiments of an education by the faithful school master, who boarded around, and made his way through storms and snow drifts, often a mile or more to the scene of his labor, made his own fire, cared for the buildings, and taught six days in a week as long as daylight lasted, receiving as compensation from $8 to $12 per month, to the conditions of the present, we find that progress here has kept pace with the advance in other directions.

In the early grants of land in the State a portion was reserved in each town for the use of schools, and this has been a perpetual income, as the lands were all rented, and the rents turned over yearly to the school fund. To-day the schools are well maintained, and though suffering in some instances from lack of




UNIVERSITY OF VERMONT.

scholars, it is the purpose of Vermont to provide that each child raised upon its soil shall have the benefit of a free school to attend, within a reasonable distance, or, if remote from school privileges, to provide for transportation to and from school.

The State goes further than to provide schools. It makes the attendance of children within certain ages compulsory, and provides punishment for the parent or guardian who neglects or refuses to send them. Though the common schools are the bedrock upon which is grounded the educational system, and the schools from which a majority of the scholars receive all the privileges they ever acquire, there are provided excellent institutions for higher and professional training. The largest and oldest of these higher institutes is the University of Vermont, located at Burlington, which has connected with it the State Agricultural College and Experiment Station, and an excellent Medical College. It has the several departments usually found at modern universities, embracing classical, agricultural, scientific, civil, mechanical and electrical engineering, all of which are supported by an able corps of professors. Middlebury College, at Middlebury, was chartered in 1800, nine years later than the University of Vermont, but was the first college to graduate students, holding its first commencement in 1802. This college has a classical and scientific course. Norwich University was founded in 1820, and established at Norwich. It was removed to Northfield in 1866. The distinctive feature is its course in civil engineering and military science. Two hundred seventy-three commissioned officers from this institution served in the Mexican and civil wars. Besides its three colleges, Vermont has excellent schools for higher education located at St. Johnsbury, Saxtons River, Poultney, Peacham, Bakersfield, Burlington, Bellows Falls, Barre, Montpelier, South Woodstock, Lyndon, Derby, New Haven and Craftsbury, Normal schools for training teachers at Randolph, Johnson and Castleton, and graded schools in nearly all the larger towns, in many of which students are fitted for a college course.

HAY MAKING.

## TEMPERANCE.

Closely connected with the subject of education in the minds of Vermonters is the subject of temperance. Vermont was one of the first States to enact laws restricting the sale of intoxicating liquors, and makes temperance one of the subjects to be taught in the common schools.

For years the State has had a stringent prohibitory law, and the result of the efforts made on this subject has been to very greatly restrict the traffic. At the present time there are few violations, except in the larger towns, and here public sentiment is coming to demand a more thorough enforcement of the law; and where this is demanded the traffic cannot long endure, as Vermont law on this subject carries sharp and severe punishment.

The police regulations of the State are of the best. Ample provision is made for all offenders at the various State institutions. The Prison at Windsor, House of Correction at Rutland, and Reform School at Vergennes are ample in their accommodation for the needs of the State, and it is a matter of credit that they are not crowded with inmates.

## AGRICULTURE.

In few places is it more literally true than in Vermont, that agriculture is the foundation upon which all other industries are builded. Until quite recently agriculture has been almost the *only* industry of the State, and very great attention is given to the study of the best methods, and the proper lines upon which to work, in order to secure the best results. The farming land of Vermont is of great fertility, composed largely of disintegrated rock. It has an enduring quality found in few localities. After a hundred years of cultivation and continuous cropping, it is found, by consulting the census of 1890, that the record of its products takes a high place. In raising wheat only one state pro-

GROUP OF AYRSHIRE CATTLE.

duced as much per acre ; of corn, two states only exceeded Vermont's record ; four states only produced more potatoes to the acre ; in buckwheat only one state exceeded Vermont ; five states produced more barely per acre ; five states produced more rye per acre ; one state more oats. Vermont occupies the first place in both quantity and quality of maple sugar produced. Taken as a whole, Vermont takes the first place in a general average of quantity and value of all these farm crops per acre.

From the census it also appears that the average value of farm crops for each person employed is $400, against an average for the United States of $289. It also appears that from 1880 to 1890 the taxable property of the State showed an increase of 86 per cent., the average for the United States being 43.46 per cent. Only sixteen of the states and territories showed as large an increase, and of these all except Florida were west of the Mississippi river, and had received large gains in population. Again, the census shows taxable property to each person in Vermont as $485.98, and an average for the United States of $387.62.

## POPULATION.

The consideration of the foregoing facts naturally leads to an inquiry in regard to the population of the State, and in this it is found that the State has remained nearly stationary. The larger towns have nearly all showed an increase, and the smaller or farming towns have fewer people than ten or twenty years ago. Several causes have contributed to produce this condition, among which may be noted the large emigration that has gone out from the State to settle new territory. The building up of manufacturing, and the development of mining and quarrying has tended to draw from the rural districts, and others have not come to fill the places made vacant. This has led to a scarcity of help among the farmers, and the partial or complete neglect in certain localities of good farming land. There has also come a change in the methods of farming, intensive taking the place of extensive methods,

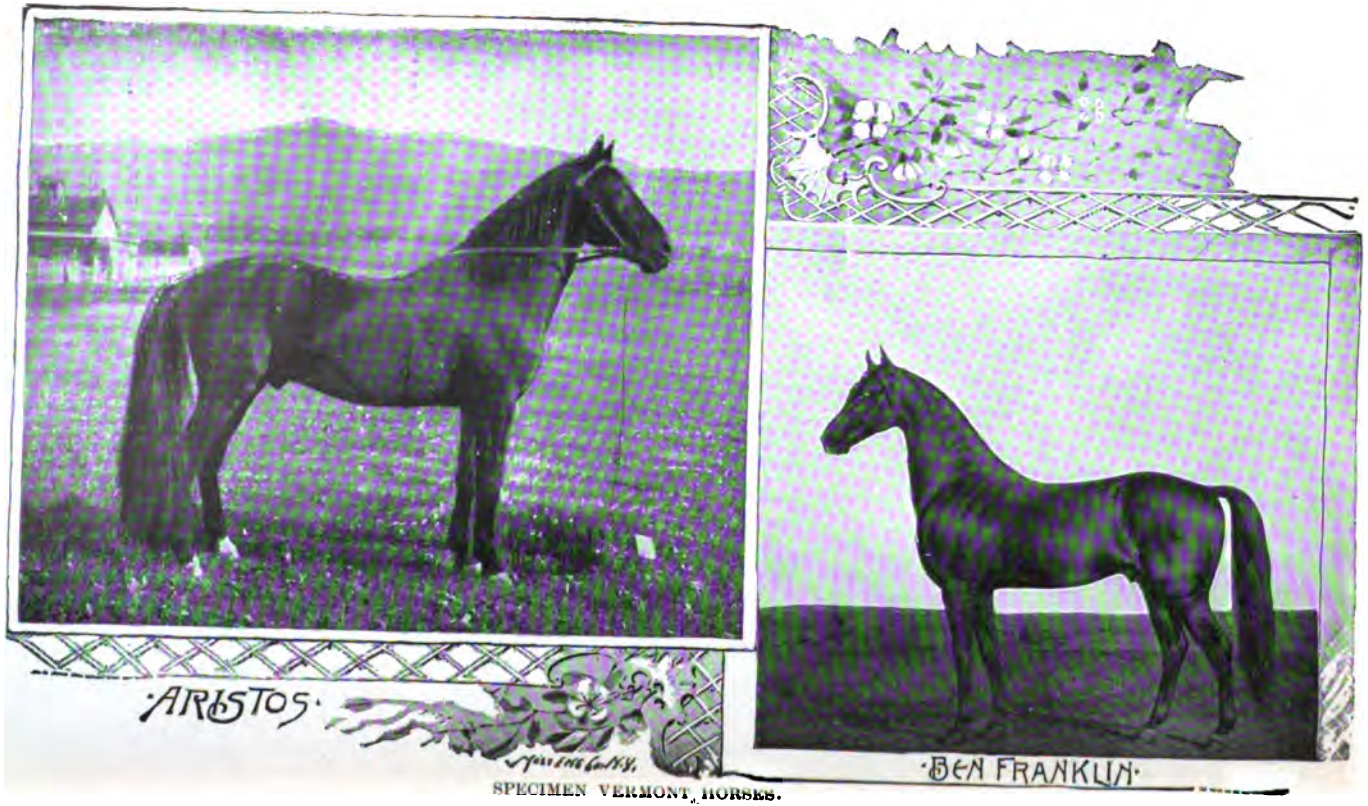
GROUP OF JERSEY CATTLE.

and by this means less land is required to produce the same amount than formerly, and this has put a portion of the larger holdings on the market. It is probably true that few localities can offer so good an opportunity to undertake farming on a small capital as Vermont.

The Board of Agriculture has issued a catalogue this season, containing descriptions of about 200 Vermont farms that are at the present time without tenants, and on the market at a very low price. This pamphlet, as well as others issued in recent years by the Board, in which Vermont and its industries are described, will be sent to any who may apply for the same to Victor I. Spear, Braintree, Vt.

## DAIRYING.

The leading agricultural interest of Vermont at the present time is dairying, and the rapid advance made in the past few years indicates for it an important future. The methods employed, the stock kept, the feed supplied, have all undergone a transformation. At the present time, the majority of the milk produced is made up into its products of butter and cheese in the private dairy, though the establishment of creameries has gone forward at quite a rapid pace within the past few years, and in no year have so many been established as within the past twelve months. They are proving of great benefit, especially to the dairyman with only a few cows, who cannot afford to give up his time to dairy work. The separator and cold deep setting systems are both in use, but the past year or two has witnessed a tendency in favor of the separator. The largest creamery in the world is located at St. Albans, and is supplied by about 60 separators along the lines of railway centering at St. Albans. The creamery has 1,000 patrons who own 15,000 cows. In 1892, 2,060,000 pounds of butter was made, the most made any day being 18,000 pounds. This creamery has a capacity of 25,000 pounds per day. It has so far been unable to supply the demand of the market for its butter.




SPECIMEN VERMONT HORSES.

The State is found to be admirably adapted to dairying, and its dairy products have always taken a high rank. The sweet feed of the June pastures, and the rich grasses and corn stored for winter feed, and the pure water which everywhere abounds, are all essential elements of successful dairying. In recent years, the Vermont farmer has found that by means of the rapid communication between the farm and the city, it is possible to supply not only cream, but in many cases milk, to the city trade. The favorable location of Vermont, within five or six hours of all the principal cities of New England and New York, is a very important advantage to the Vermont dairyman, as it enables him to supply the trade with products that are fresh, and deliver whenever needed. The quality of Vermont dairy products is pretty well established from competitions made with the world, the two last of which, at Paris and Madison Square, both resulted in bringing the gold medal to Vermont, in the first instance going to the Moulton Brothers, of Randolph, proprietors of the Green Mountain Stock Farm, and in the latter case to Hon. Homer W. Vail, of Pomfret.

Another important factor in Vermont dairying is the cow used for the purpose, and probably no one element is more important. After trials extending to all breeds, it is pretty well established in the minds of Vermont dairymen, and there is a practical unanimity of judgment among them, that the Jersey cow is the animal adapted to the purpose and the conditions that here prevail. Not that other breeds do not have their advocates and friends; they do, and in some sections the Guernsey is a formidable rival for public favor. In the vicinity of cheese factories, and where the milk is to be sold to families, the Ayrshires have many friends, and have made a good record. Some, also, are friendly to the Holstein, others adhere to the Durham or the Devon, and each may have advantages to meet a particular case. Many dairies in Vermont are producing an average of 300 pounds of butter per cow per year, some exceeding this amount largely, and one, a dairy of 21 cows, having exceeded 400 pounds in 1892. No estimate made in 1889 fairly represents the dairy interest of 1892. The progress has been marked in many localities, and the 140 pounds average of the

VERMONT MERINO SHEEP, 1893.

State, made from the census of 1889, would need to be added to in representing the present average.

## HORSES.

The reputation of Vermont in the production of horses rests upon the fame achieved by the Morgan breed. This class of horses sprung up from the use of a stallion owned by one Justin Morgan, of the town of Randolph. This stallion, in his day, did not attract very great attention, but had a local reputation for great strength and endurance, coupled with a good degree of speed, but was rather below the ordinary size. The descendants of this sire retained his qualities in a remarkable degree, and established the breed of horses bearing the name of the owner, a breed in which Vermont takes great interest and pride, and to which the horses of the country are largely indebted for the best qualities possessed at the present time.

Vermont has been found to be adapted for developing and perfecting animals of medium or small size, whether in horses, cattle, or sheep, and the Morgan horse possessed just those qualities which were adapted to Vermont conditions. This blood has been sought for by the breeders of the country, and a large per cent. of the noted horses trace back to the Vermont Morgan, and from this blood have received much of that which is best. For a time Vermonters were inclined to neglect this stock on account of the demand for larger horses, and during these years of neglect a large proportion of this stock was sold, and has since laid the foundation for successful horse breeding in other States. At the present time great interest is being taken in preserving what is left of this blood, and rapid advances have been made in the past ten years in producing a fine class of horses. For the class of horses termed "gentlemen's drivers" the Vermont Morgan horse has won the first place. In this blood is found united in a remarkable degree the qualities demanded—fair size, free action, great endurance, willing workers and intelligence. Vermont has at the present time

some fine specimens of this breed of horses, two noted sires of the present day being shown in the accompanying engraving. Some intelligent breeders of this class of horses are receiving a liberal reward for their labor and skill, and it may be doubted if there is any department of agriculture offering better returns at the present time than intelligent effort in producing the horses demanded by men of wealth.

And it is a question hardly susceptible of doubt that in no section can this work be followed with more advantages than in Vermont. In Vermont one finds a climate exactly adapted to developing to the highest perfection. Feed, whether from pasture or meadow, rich in all the qualities of flesh production, lands to be bought at a low price, breeding stock available of the highest excellence, and the advantage of breeding on the same ground that has developed this particular class of horses—with these advantages in their favor, it is confidently expected that breeding superior horses in Vermont will increase, and thereby add to the prosperity of both the State and the breeders.

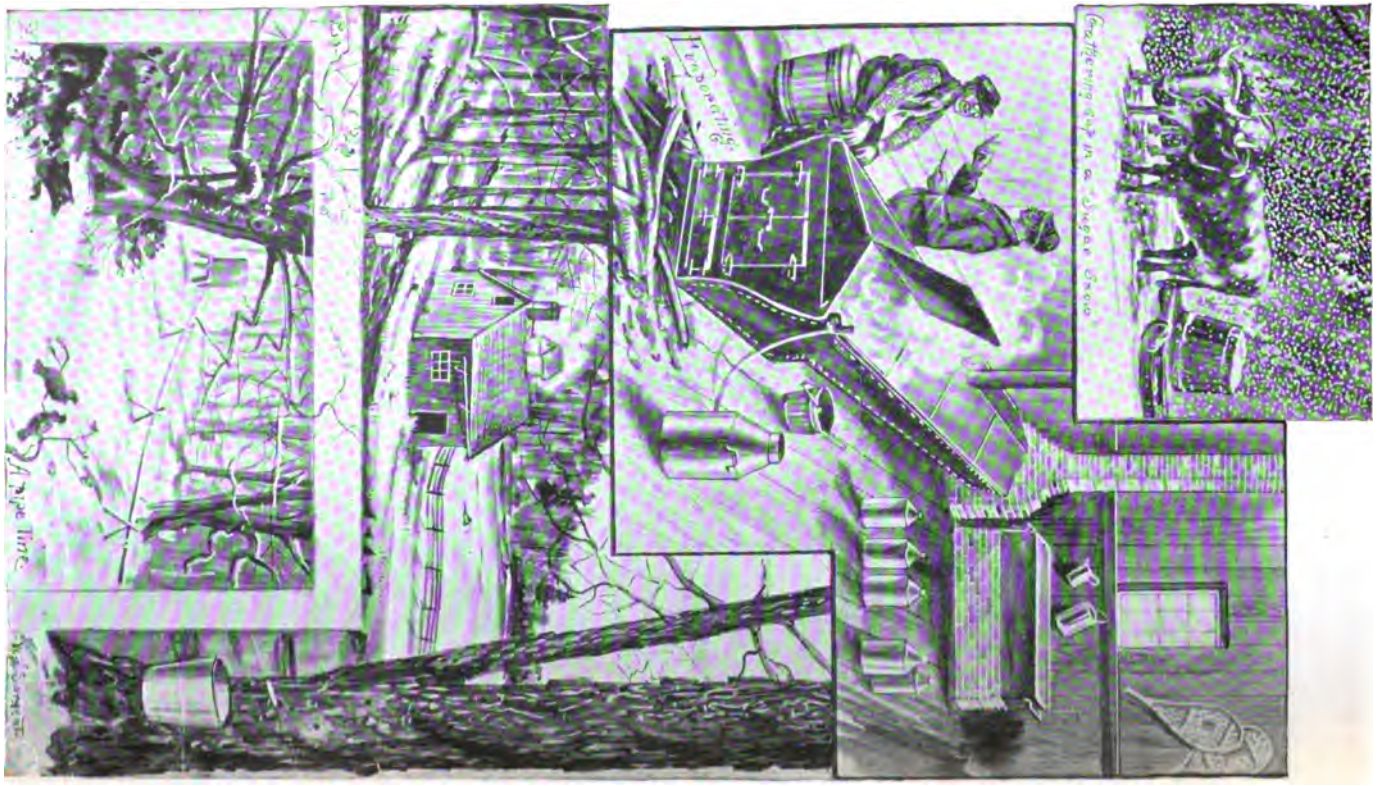
## SHEEP.

The history of sheep husbandry in Vermont extends back to the earliest settlements of the State. The wool formerly spun and woven in the homes of the early settlers, from which clothing for the family was provided, was raised upon the few sheep which every settler thought it necessary to own. From raising wool for the use of the family the industry extended, and wool was produced to sell to the local factories which came into existence, and from that extended until it became *the* source of income to the farmer. Oxen were kept to do the work, sometimes a horse by the more prosperous to take the family to church, a cow to provide milk and butter for the family, and the balance of the farm crops were mainly fed to sheep, and the income from the sale of wool was almost the sole source of money revenue from the farm. This

industry increased rapidly, and early attention was given to improving the quality and quantity of product per animal. This desire for improvement led to importing sheep from Spain for this purpose. Importations of the Spanish Merinos were first made early in the present century, and during the war with England the price of Merino wool reached the phenomenal sum of $2.50 per pound. Farmers were wild with desire to possess sheep, and especially Merinos, and prices for Merino stock rams reached to $1,000 per head.

VERMONT MERINO SHEEP, 1845.

Following this excitement, at the close of the war, a dead calm settled over the sheep industry for a time, and the thousand dollar sheep came to be sold at about a dollar per head, but still the number of sheep on the farms continued to increase, and in 1840 reached the number of 1,681,819, producing on an average 2.2 pounds of wool per head. In 1890 the number of sheep had decreased to 362,112, averaging 6.1 pounds per head. With only about one-fifth as many sheep, Vermont is producing two-thirds as




MODERN SUGAR-MAKING.

many pounds of wool now as in 1840. These figures from our census reports are perhaps a sufficient commentary as to what the Merino has done in the way of improving the fleeces of Vermont sheep. Vermonters have found large profits in improving and developing the Spanish Merino, not only from increasing the wool product of their flocks, but also in supplying this stock to the flock masters of this and foreign countries.

In Vermont the Merino sheep found favorable conditions, and a people disposed to give them every advantage of skill and care; and there are in the State to-day many flocks that for more than half a century have been bred upon the same farms by the original owners and their descendants. This persistence and devotion to this stock, together with the favorable conditions of the State, among which may be enumerated soil, climate, water and feed, has placed the Vermont Merino in the front in every market, and the Vermont standard is more largely accepted in this and foreign countries than any other. Ample evidence to sustain this claim is found in the long list of gold medals and first prizes which have come to Vermont breeders from the international expositions held at Hamburg, Philadelphia and Paris. Probably no business employing a like capital has ever brought to the State so much money as the Merino sheep.

The breeding at the present time is limited to a few persons who have made it a life business, and will be slow to abandon an industry that has been so successful for nearly a century. There have always been seasons of high prices for this stock, followed by corresponding low prices; so that in any season when prices rule low, and the demand for breeding stock is light, it is expected that in the next turn history will repeat itself and good prices prevail. Perhaps in no other occupation has there been so large a demand for faith in the future as in Merino sheep breeding, and each time those who have possessed faith have been rewarded. There is renewed interest in sheep in some portions of the State, in view of the fact that our markets are calling for mutton in recent years, and it is found that Vermont is admirably adapted to supply this demand. The markets of the large towns of the State, as well as

the cities of New England, take all that can be produced of good mutton at remunerative prices.

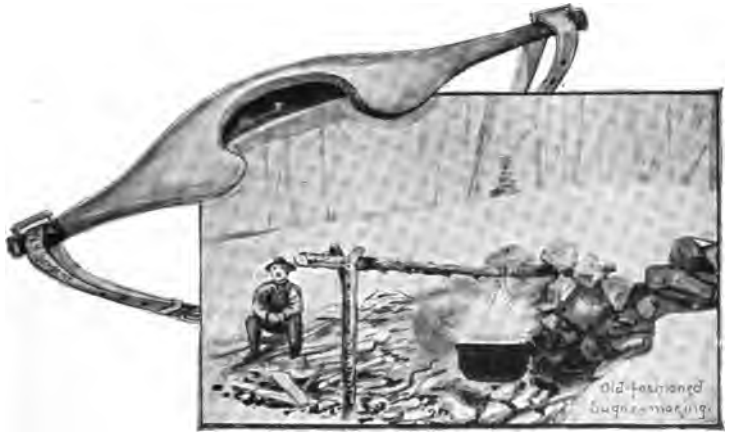
The low price of Vermont farming land makes it possible to raise this product in competition with any sections of the country, and to have the added advantage of markets within easy reach. Sheep raising in Vermont has undergone a marked change in the past fifty years, but to the man who has kept abreast of the times, and made his product to suit the demand of the present markets, it has been found fairly profitable, and indications at the present time are that the industry is likely to increase.

## MAPLE SUGAR.

The single product in which Vermont excels all other States, in both quantity and quality, is maple sugar. The entire product of the country for 1889 was only about 50,000,000 pounds, or less than a pound for each of its population. Of this amount, Vermont produced nearly or quite one-third, and in producing it only used from one-third to one-half of the maples of the State. So, although one of the earliest industries of the State, there are few that lack so much of being fully developed as this, and it would seem that a product that is so generally known, appreciated and sought after, should yield a profit sufficient to insure its production to the limit of the capacity of the State.

Improved methods of manufacture, together with an increasing demand for the best quality as an article of luxury, is doing much to increase production. There is a wide contrast between past and present methods of making maple sugar. In the early days the first settlers used to tap their trees with an ax or tapping iron, catch the sap in troughs dug out of basswood logs, and boil in a kettle swung upon a pole, where it was possible to boil from fifty to one hundred gallons of sap per day, and to make from it a product dark in color, possessing sweetness, and also flavored with the various impurities of charcoal, ashes, leaves, etc., incident to the exposed condition of doing the work. The wooden troughs

were first replaced with wooden pails or buckets, and later with tin ; the iron potash kettle, first with the small pan, and next the evaporator. The work has been transformed from the open woods to neat and comfortable sugar houses. The sap which used to be carried upon the shoulders of the sugar-makers, making their way much of the time upon snow shoes, is now drawn with teams in suitable tanks or tubs, or conducted through lines of piping direct to the storage provided at the sugar house. All these changes indicate the progress that has taken place in this work, and




accounts for the fact that much of the best sugar produced at the present time is suspected of being adulterated, because the *flavor* and *color* of former days is found lacking. At the present time only a few hours after the sap leaves the tree it is in the form of syrup or sugar, and ready to be marketed. The cuts employed show very well past and present methods and conveniences for making maple sugar. Among the best sugar makers sap is seldom, if ever, allowed to stand over night before boiling. Teams or men are kept at work gathering during the day and delivering to the evaporator, which is capable of reducing to syrup with great rapidity, the capacity varying with size of rig from 25 to 100 gallons per hour. By means of this frequent gathering and rapid boiling the sap is in contact with the air but a short time, and discoloring is prevented. Could sap be evaporated without exposure

to the air and loss of time, the product would be almost absolutely white.

The market for this product has extended, and the uses for it multiplied. It is little used at present as a domestic necessity, but as a luxury, and large quantities are sold as maple syrup or honey, which is put in air tight packages and sealed while hot, and if properly put up will keep indefinitely.

Maple sugar is used extensively by confectioners for maple candy, by the housewife for making cakes, pies, cookies, etc., it giving a flavor for such uses superior to any other sugar. The demand for the maple product has given rise to much adulteration and counterfeiting, and it is probably true that there is more of the counterfeit than the genuine on the market. To protect their customers against fraud the Vermont maple sugar makers have formed an association, and adopted a trade-mark for their goods which is protected by a copyright, and which can only be used under certain restrictions. Persons buying sugar or syrup bearing the label of this Association can be certain of securing a pure and first-class article. The names of the members will be furnished on application to the secretary, A. J. Croft, Enosburgh Falls, Vt.

Though, as has been said, a large part of the available maples are at the present time unused, and though there are farms on the market to-day for a less price than the value of the maples upon them for sugar purposes, improved methods in making and marketing are having their effect, and the business at the present time is increasing each year.

The early custom of sugar parties, in which whole neighborhoods are invited, has not passed away, and the old and the young gather with old time interest to eat sugar spread upon snow, with the accompaniment of doughnuts; nor has the preference for the scum that rises in process of boiling lost caste. To-day the sugar maker tests his syrup by thermometer or hydrometer, knowing exactly the condition of his product, and whether it is fit for syrup, tub sugar or cakes. The custom of testing by means of watching it apron from the ladle or dipper, by dropping in cold water, or blowing from a brown splint, has been superceded by

accurate and reliable scientific tests. It is not claimed that all the maple sugar produced in Vermont at the present time is of standard quality; but the proportion of this class of goods is increasing each year, and when so made the industry is found to be profitable. And in proportion as the markets come to know pure from adulterated maple sugar, and the sugar makers learn to produce the best quality of product, will the business increase and become more profitable.

## MANUFACTURING.

Except that in a certain sense, every home in Vermont did manufacturing in former times, it can be said that very little attention was paid to this business. Artisans in the various trades supplied the demands of the first settlers. The blacksmith, the carpenter, the wheelwright, and the cobbler were found in every community pursuing their various vocations. But establishments for producing manufactured goods did not receive early attention. Woolen mills were among the first to be erected to utilize the products of the flocks, but any general efforts in the way of manufacturing are of comparatively recent date. There were obstacles in the way of such enterprises, of which the main one was a lack of good roads and cheap transportation facilities. And even when railroads were established, they for a long time failed to appreciate that manufacturing was desirable, and made rates that, as compared with other sections, were practically prohibitory.

More recently, as the State has come to be meshed with railroads, and competition has cheapened transportation from junction points, it has been found profitable to harness a portion of the unlimited water power with which the State abounds, and many important manufacturing plants have grown up, and added largely to the material resources of the State. Some of these are closely identified with the State, producing either the products of Vermont genius or Vermont quarries in such proportions as to have

commanded the attention of the world, and taken the foremost rank. Of this class is the Fairbanks Scale Works at St. Johnsbury. The Fairbanks scale was the invention of Thaddeus Fairbanks, and the first products were made and produced in a small way, finding a limited sale among his neighbors. Under good management the business grew, until at the present time it occupies buildings as shown in the cut, and claims the largest sale of scales of any factory in the world, and its scales are the standard for all European countries, North and South America, India, China, Japan, Australia, Africa, and the East and West Indies. A close competitor in this department of manufacturing is the Howe Scale Company, located at Rutland, a younger company, that was for a time unfortunate in its management, but at the present is fast winning public favor through the excellence of its workmanship, and gives promise of a successful future.

At Brattleboro is located another industry of Vermont origin, the Estey Organ Works. The Estey Organ was the invention of Jacob Estey, and commenced under the most humble circumstances. For several years the inventor used to drive through the country with his own team, selling musical instruments to the people of the adjoining country. Good business tact, together with having produced a good organ, brought its reward, and though since overtaken by flood and other misfortunes, the business has grown to be the largest of its kind in the world, and last year the completion of the last of 250,000 organs was celebrated in a fitting manner. And as in the past, so now, no effort is spared to keep true the claim of the company that the "Estey leads the world."

One of the largest woolen manufactories of New England is located at Winooski, the Burlington Woolen Company. This company uses 5,000 pounds of wool per day, or more than 1,500,000 pounds per year, nearly as much as the State of Vermont produces. Other important woolen mills are located at Hartford, North Hartland, Johnson, Ludlow, Springfield and Bennington, and smaller mills at other places.

The Lane Manufacturing Company, at Montpelier, is the lead-

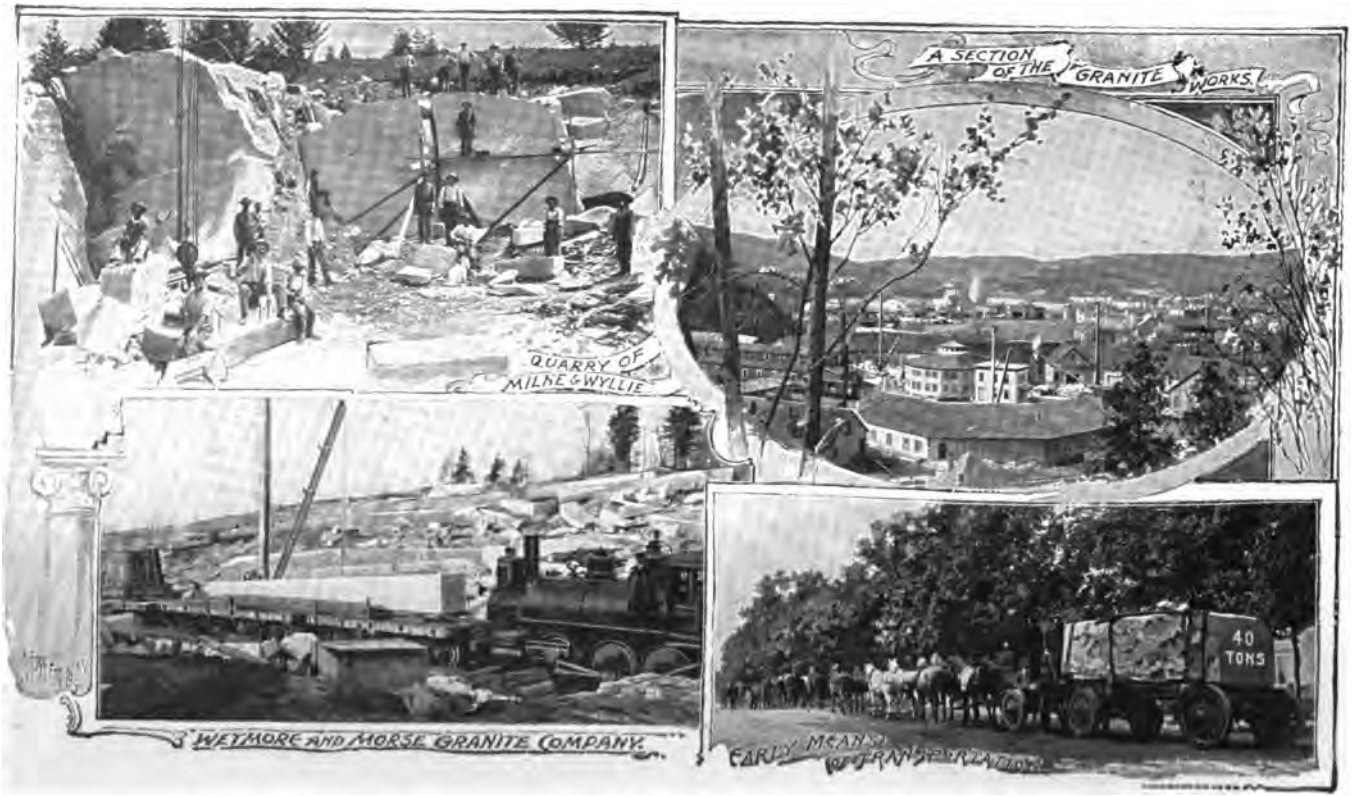
ing firm in New England in producing saw-mill machinery. The manufacture of various wood products are scattered through nearly every town in the State, producing about $4,000,000 worth of goods per annum.

The principal lumber market of the State is Burlington, whose favorable location on Lake Champlain, giving cheap means of transportation to consuming points, has enabled it to maintain its rank as one of the leading markets in the United States.

Besides the works mentioned there are cotton mills, machine shops, foundries, canning factories, shoe factories, paper mills, etc., many of which have lately come into the State, all of which have found in Vermont conditions favorable to success. According to statistics recently taken, it is shown that in the past two years nearly $2,000,000 has been invested in establishing new manufactories in Vermont. This estimate does not include the working capital, but the amount invested in buildings and machinery with which to conduct the business. These various enterprises have utilized many of Vermont's idle water powers, but many others are yet unemployed, and waiting for the person who shall first discover for what purpose they can be profitably turned from their present course and made to perform useful service.

## QUARRYING.

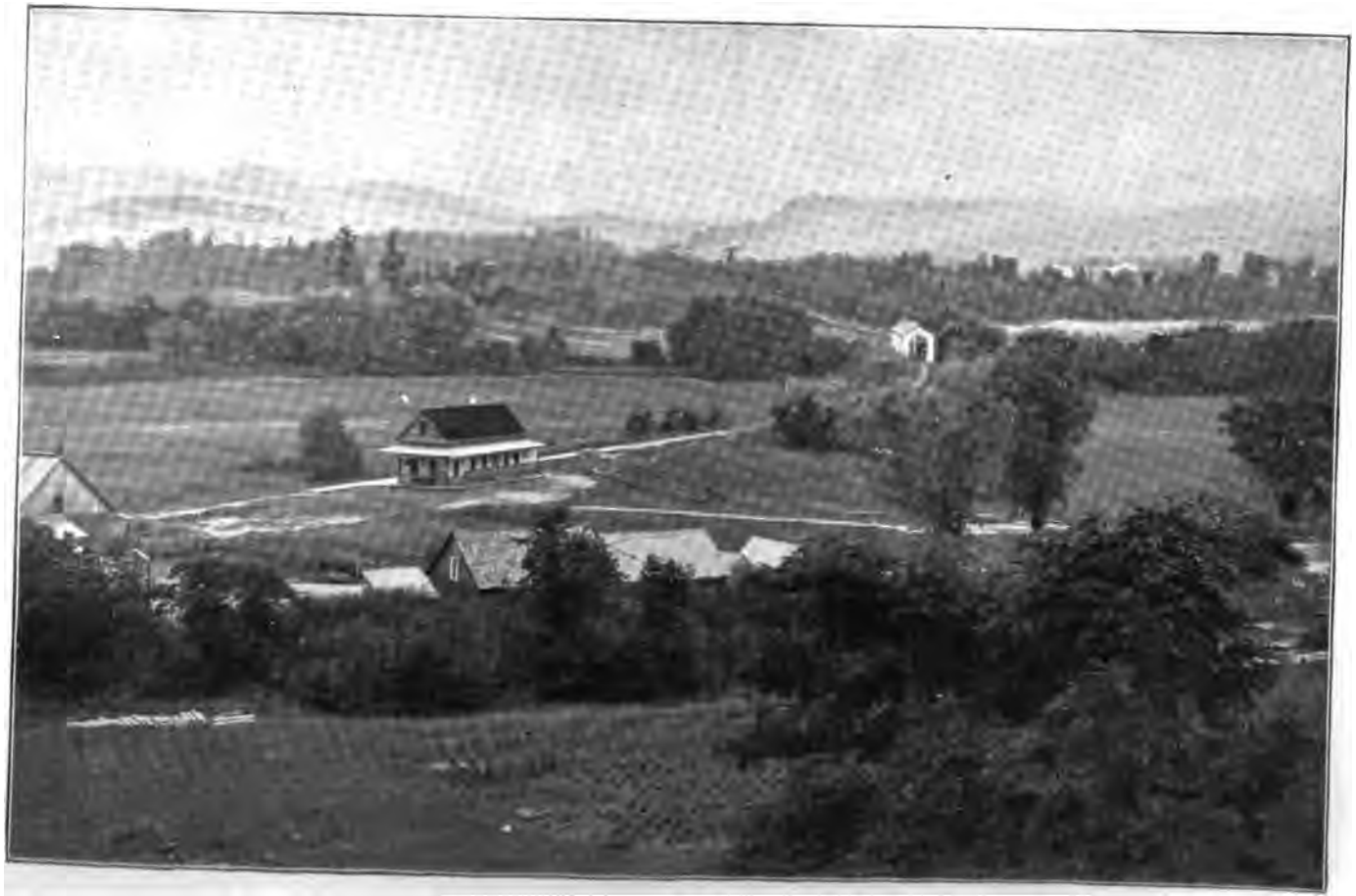
Closely allied to, and in many respects a portion of Vermont manufactures is its quarrying, and in treating it under a separate heading it is done because of itself it forms a very important part of Vermont's industrial growth, and because the product in its finished condition represents Vermont's raw material, Vermont labor and Vermont skill. Taken from the mountains, a free gift to those who discover it, there is no expense that enters into this product except the use of capital to conduct the business, and the labor bestowed upon it.


A SECTION OF THE GRANITE WORKS.
QUARRY OF MILNE & WYLLIE
40 TONS
WETMORE AND MORSE GRANITE COMPANY.

Until very recently this source of wealth has been entirely unknown, and at the present time scarcely a beginning has been made in revealing its possibility, and it requires no strain upon the imagination to foresee greater wealth from beneath the soil in quarrying the various rocks and minerals with which it is underlaid than all that has ever come from the surface. The growth and success of this business to the present time certainly suggest all and more than this.

The marble industry was the first to receive attention, and for a long time was carried on with slight knowledge of the business and with doubtful success. The early means of transportation with teams over poor roads were not such as to favor a business of this kind, and only about half a century ago it is claimed that so little was known of this business that the entire tract of land now covered by the West Rutland quarries, which was then used for a sheep pasture, was traded even for an old horse of doubtful value. Whether this is true or not it is unnecessary to inquire, as it is known that it might easily have been true of the site of the West Rutland, or other quarries of the State, at that time. It is only about twenty years since this business took form, and begun to be conducted in a way to make it profitable. The use of marble has demonstrated its capability of withstanding the effects of air and sun and rain, and no stone is so highly valued for monumental or building purposes. At the present time over half of all the marble used in the United States is quarried in Vermont, and nearly 90 per cent. of all monumental marble is obtained here. Quarries of marble are now operated at different points along the western portion of the State, extending from the earliest known black marble of Isle La Motte to the quarries of Bennington county. In 1891 there were 3,317 men employed in this work, receiving in wages and salaries $1,162,746; and capital invested amounting to $7,394,525.

The largest company operating in marble in the world is the Vermont Marble Company, whose headquarters are at Proctor. This company, through its efficient first president, Redfield Proctor, did a great work in simplifying the means of production, and



BRADFORD STATION AND CONNECTICUT RIVER.

introducing machinery to supplant manual labor in many of the processes of manufacture. It is claimed that the process of sawing marble by means of sand and a toothless strip of iron was the invention of Isaac Markham, of Middlebury.

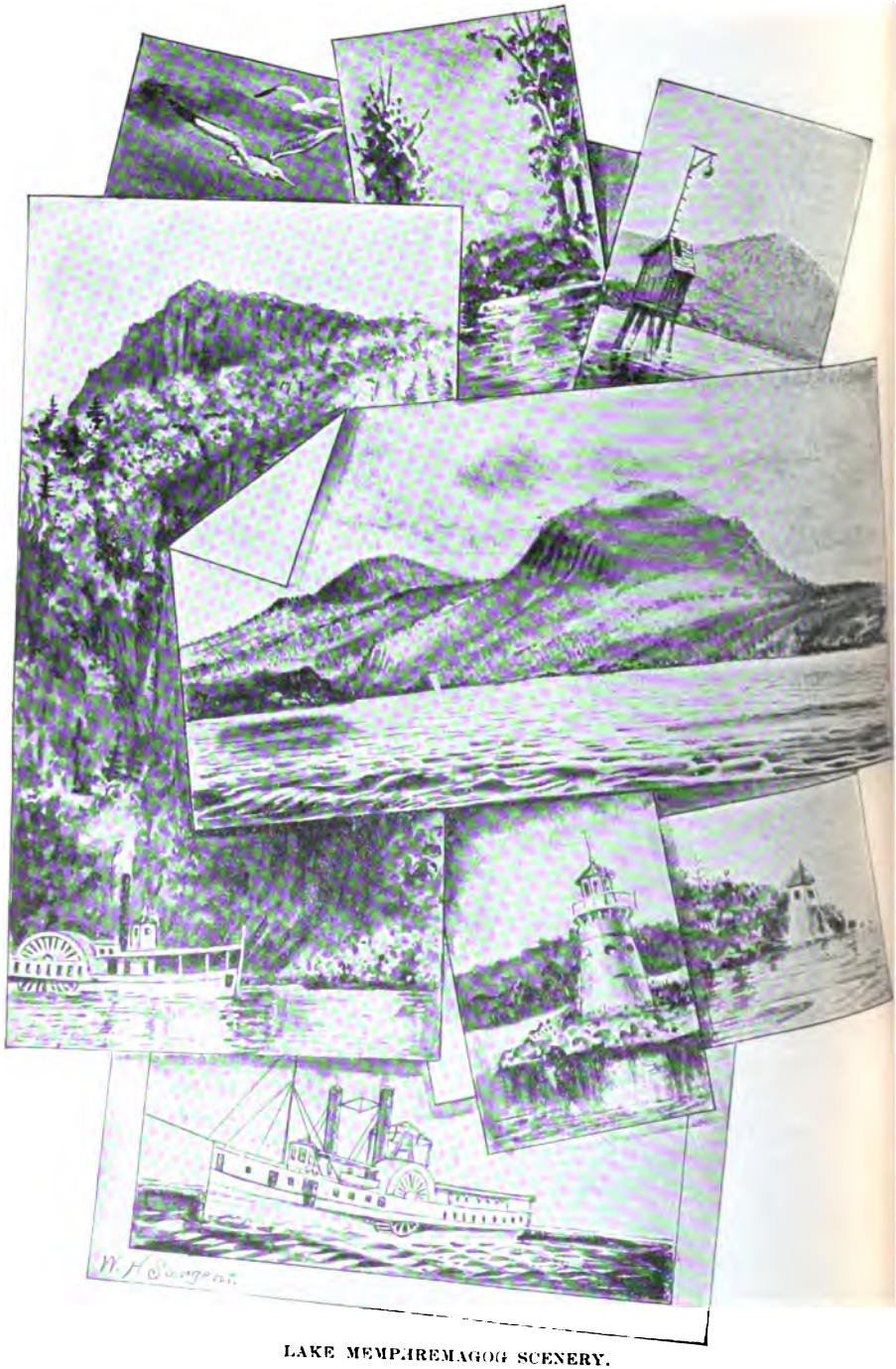
The claim is made that the entire western part of Vermont is underlaid with a marble formation, of which it is impossible to know anything as to where the valuable deposits are located, except as chance or investigation reveals it. The principal portion of the marble now produced in Vermont is within a radius of five miles from the city of Rutland, and to estimate the future possibilities which may lie in this direction is suggested as a problem suitable to employ the most vivid imagination in its solution.

## GRANITE.

Younger than the marble industry, but not less important, is the production of granite. It was quarried as early as 1812, and used for building purposes in walls, window caps, and underpinning to a limited extent, and was found upon the surface throughout a large portion of the State. The building of the second State Capitol of Vermont, nearly sixty years ago, from this material, gave to us one of the finest Capitols in New England, and at the same time informed the world of the wealth of this product which lay stored in the granite hills of Barre.

But it is of very recent date that anything has been done toward bringing granite working to the position it now occupies.

In 1875 the town of Barre became connected with the Central Vermont system of railroads by a donation of $55,000 for the building of a branch road. This furnished an outlet for the production of her quarries, and the beginning of the manufacture of monumental work was made. Though still in its infancy, this industry has become of great importance, not only to Barre, but to the State. Another railroad, costing $250,000, has been made to




LAKE MEMPHREMAGOG SCENERY.

the quarries, and over this road 1,000 tons of granite have been carried in one day, and 100,000 tons, besides 22,000 passengers, in a year. More than 70 acres of quarry have been uncovered, and equipped with the latest improved derricks, steam drills, and other machinery, and the granite works in the village have an aggregate floor space of more than six acres.

If all the plants engaged in the finishing of this material in Barre could be combined in one manufacturing center it would occupy a space of more than fifty acres, give employment to 3,000 men, and pay them yearly $2,000,000. And this industry is the growth of only twelve years!

The granite business has changed the population of the town from 2,000 to 10,000, increased its valuation from $700,000 to $3,500,000, and furnished monumental work, made from the best quality of granite, to every state in the republic. The manufacturers had an exhibit of Barre granite at the World's Columbian Exposition.

Granite quarries have been opened in other towns, among which are Hardwick, Williamstown, Dummerston, Berlin, Woodbury and Ryegate, and many other localities report large deposits of this mineral, and some are already doing a small business and others organizing. No industry in which Vermont has ever been engaged has employed so large an amount of labor for capital employed as granite, and the production of the State is only limited by the demands of the market.

Slate is another of Vermont's important mineral products, and is a close competitor with marble and granite. It is quarried now principally at Fair Haven and Poultney, in Rutland county. Other localities have quarries that are being worked to some extent, and others that are now idle. Nearly fifty companies are now engaged in this industry, and employed in 1891, 1,323 persons, paying in salaries and wages $572,515 per year. Nearly one-fifth of all the slate produced in the United States comes from Vermont. no state except Pennsylvania producing as much. The improved machinery and methods now employed in this work are likely to render profitable some of the quarries that have been

WINOOSKI RIVER NEAR MIDDLESEX
DAM & FOOT BRIDGE PROCTOR.
THE HEADLAND ISLE LA MOTTE.
SOUTHERLAND FALLS. LOW WATER.

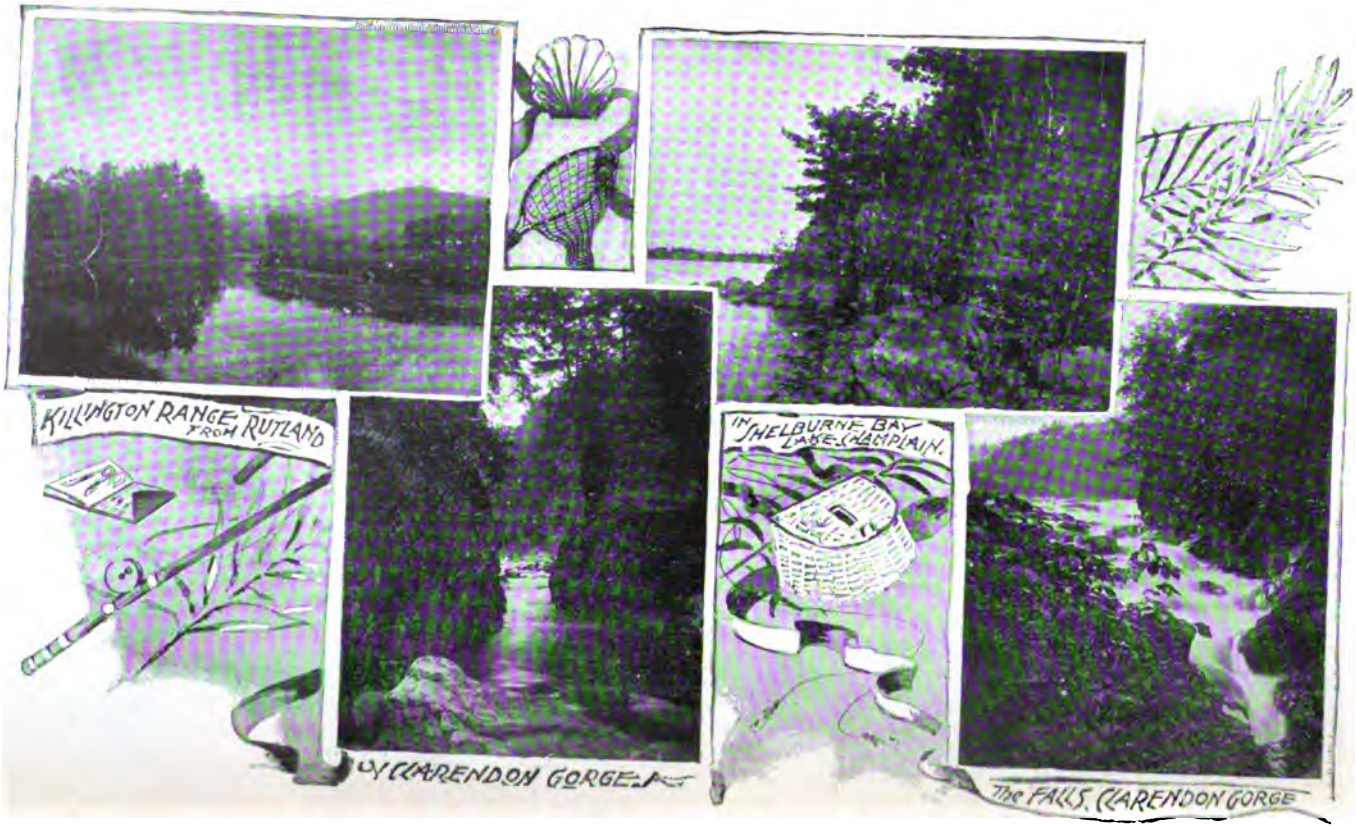
abandoned in the past, and place the business upon a profitable basis, and in this way largely increase the product from the State.

Besides these three leading mineral resources, the State has deposits of others that have been worked to some extent. Among these is copper that has formerly been produced in Vershire and Strafford, employing a large force of workmen. Something is now being done in this work, though the failure of the companies formerly operating, by bad business management, has served to check and retard production. Paint is found at Brandon and has been largely used, is of a durable character, but lacks somewhat in fineness. Iron, talc, soapstone, freestone, asbestos, kaolin and quartz are also found in several localities, and in some sections something is being done in the way of working them.

## SCENERY.

The scenery of Vermont is a subject that has often engaged the thoughts and pens of the best writers of both this and foreign lands, and each has viewed it from a standpoint of his own, and taken in that portion which was within his range of vision, and each new writer has found a new field and new subjects upon which to exercise his descriptive powers. Its mountains, with their peculiar beauty, timbered and green to their summit, lofty and magnificent in their proportions, and beautiful in their disorderly yet harmonious arrangement, has inspired many an attempt to place them before the world in a word picture as they appear to the eye. The landscape viewed from the summit of these mountains, in which could be seen villages, farms, lakes and rivers within a radius of 50 or more miles in either direction, has called forth ardent appreciation, and been often written upon by those who have been privileged to behold it.

The valleys, too, have called forth frequent praise from those who have enjoyed the fine drives along their course. The rivers


KILLINGTON RANGE FROM RUTLAND
IN SHELBURNE BAY LAKE CHAMPLAIN.
CLARENDON GORGE
THE FALLS, CLARENDON GORGE

on their way to the sea, sometimes wild with fury in passing the steep declivities in their course, at other times sluggish while winding their sinuous course through the meadow lands, always clear as crystal and pure as the fountains from which they sprung, have elicited much admiration, both by those who have followed their course in pursuit of the gamey trout with which they abound, and by lovers of nature in either her peaceful or wrathful moods.

The thousands of ponds and lakes hid among the mountains, and surrounded by some of the finest scenery that the eye ever beheld, have afforded pleasant retreats for many a sportsman and lover of nature who annually testify to their appreciation by a return to spend a season in their vicinity. The pure air of the mountains, free from contaminating poisons or germs, which is filled with health and vigor for those who breathe it, has many times been extolled by those whose salvation it has been. The quiet, industrious life of the people, free alike from the enervating influence of wealth or the dependent servility of poverty, and the absence of both aristocracy and peasantry, have elicited much unsought praise from those who have come to know them. The historic interest of Vermont dates back to its first settlement. The Green Mountain Boys at Lake Dunmore, and in their subsequent operations in preparing their attack upon Crown Point and Ticonderoga, the bloody fields of Hubbardton and Bennington, the massacre of Westminster, and the raids of the Indians, have made memorable many localities, and as one comes to know the State, it is a surprise to find how much of its territory is historic because of deeds of heroism or suffering, self-sacrifice or torture that is connected with the spot, and the annals of the State have been well preserved by those who have known of its events.

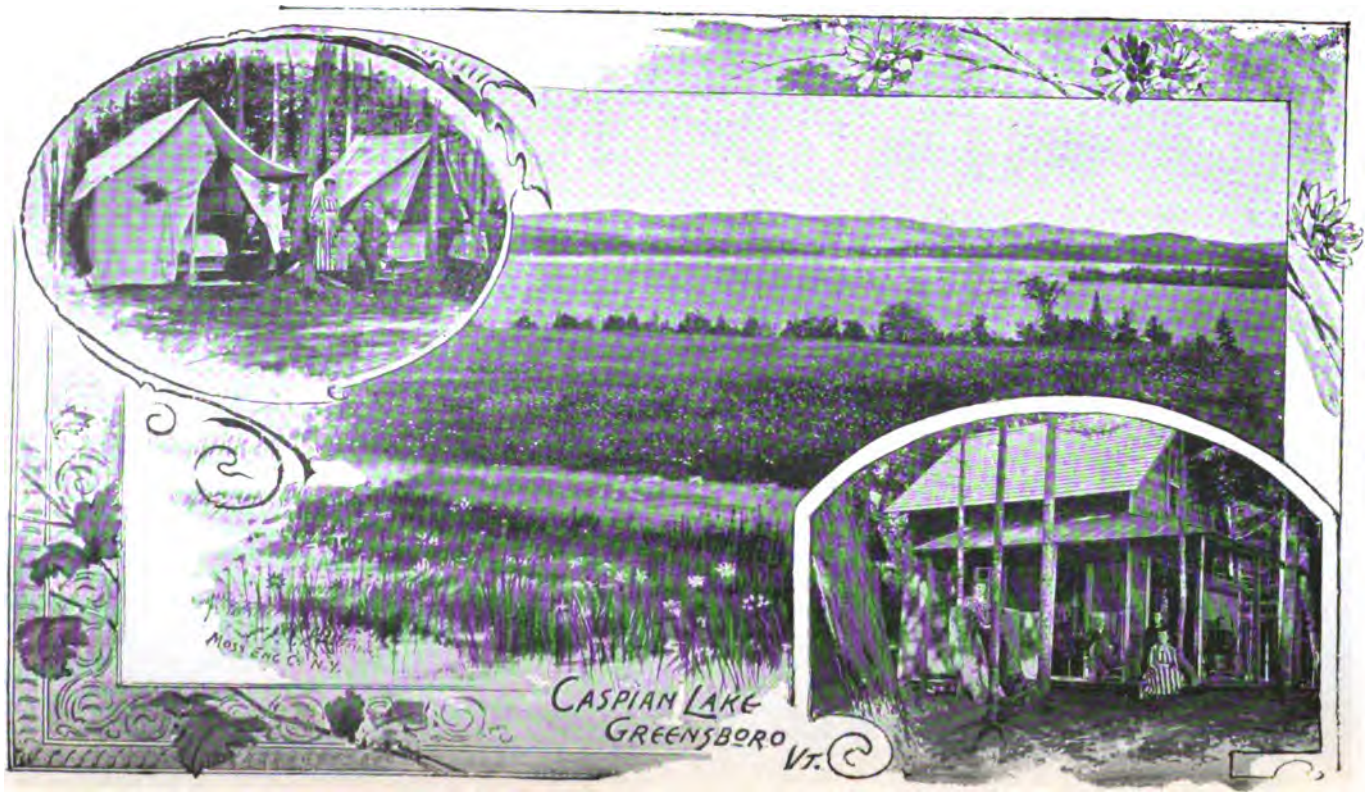
The love of Vermonters for their State has often been a topic of discussion and sometimes of surprise to those who have known nothing of the conditions, and many things have been written and said in praise of the State as its absent sons have gathered to revive the memories of youth, and to sweeten age with pure draughts of fond recollections of the State of their nativity. Notwithstanding all these things that have been so well written upon or talked

Clark Island from Isle la Motte
North Hero City from Allens Beach.
West Shore of GRAND ISLE.
Clarke's Point PELOT'S BAY Lake Champlain

about, it is impossible for the stranger to know Vermont until it has been seen. Though hundreds of places and events have been described, there are thousands that neither camera has taken, pencil portrayed, or pen described, that are of equal interest and beauty, and events of history and characteristics of the people that are continually new. The feature of Vermont scenery is that its story cannot be told or pictured. To the lover of nature it is one grand gallery of divine art and beauty, and each step that is taken gives a new point of sight from which the scene puts on a new and different aspect. Perhaps it would be more proper to say that it was beautiful rather than grand, restful instead of exciting, and pleasing rather than surprising. Of all I have seen in the way of description of Vermont scenery, nothing better than the following from the pen of Rev. William H. Lord has ever come to my attention:

"A few regions God has made more beautiful than others. His hand has fashioned some dreams or symbols of heaven in certain landscapes of earth; and we have always thought that the Almighty intended, when he formed the hills of Vermont and shook out the green drapery of the forests over their sloping shoulders, and made them fall in folds like the robe of a king along their sides, to give us a dim picture of the new creation and the celestial realm. Italy is a land of rarer sunsets and deeper sky, of haunting songs and grander memories; Switzerland is a region of more towering sublimity and unapproachable grandeur; but in all the galleries of God there is none that so shows the exquisite genius of creative art, the blending of all that is beautiful and attractive with nothing to terrify the eye, the mingling of so much of the material glory, both of the earth and the heavens, with so little to appal the sense. Vermont in summer is the Almighty's noblest gallery of divine art."

Though impossible to even mention the points of peculiar interest in the State, a word of explanation or history is here given of some of the points represented in the engravings we have used. And it is but just to ourselves and to localities that are not given a place, to say that the preparation of this work was decided upon just at the approach of winter, and it has been impracticable to take views of scenery to any great extent for this work, and we


Moss Eng Co N.Y.
CASPIAN LAKE
GREENSBORO VT.

have been obliged to select and arrange to the best advantage from such material as could be found with our artists.

Lake Dunmore is and will always remain a point of interest to Vermonters, not only from its natural beauty and situation, at the base of the western slope of the Green Mountains, from whose eastern shore there rises to its full altitude the mountain range, with no intervale or cleared or cultivated field to break the rugged character of the scene, but because on its eastern shore was located the earliest rendezvous of the Green Mountain Boys in their organization to resist the authority of New York over land granted by New Hampshire. Also, upon the bosom and along the eastern shore of this lake are located the scenes of the opening chapter of Thompson's story of the Green Mountain Boys, and according to his narrative, the first punishment administered by these mountaineers to their enemies was a bath in the quiet waters of Dunmore.

Farther back in the mountains, and at a short distance from Dunmore, is Silver Lake, one of the clear, beautiful bodies of water in the State, and one which draws many visitors each season.

Of Lake Champlain, of which glimpses of scenery are shown, a proper reference to its many seductive retreats and their magical beauty, or an attempt to recall the historic events that have taken place upon its bosom, would fill the entire space at our disposal. It was while sailing up this lake in 1609 that Samuel Champlain first discovered the range of mountains which gave their name to the State. It was upon the waters of this lake that expeditions were fitted out against the colonists during the War of the Revolution, and upon this lake, at the hands of McDonough, that the English received their final chastisement that ever since has remained as a wholesome remembrance. On one of the islands of this lake, La Motte, was erected the first fort upon Vermont soil, and to-day, along the shore and upon the islands of Champlain thousands of people pitch their tents, or come to spend a brief season at some of the hotels, and drink in health, enjoyment and recreation, by partaking of the fruits and products of this beautiful section, and in studying and appreciating its many beauties.

Memphremagog, on our northern boundary, is next in size to

Champlain, and has many attractive and striking features. The high and rugged prominence known as Owl's Head, upon its western shore, the islands it contains, the beautiful and thriving village of Newport at its southern extremity, and a rich and thriving farming community upon the east, are a few of the many features that have helped to render this point a favorable resort for many people each season.

Not so well known, but rapidly gaining in prominence, is Willoughby Lake in the town of Westmore, of which a recent writer has well said: "I believe I am warranted in saying that nature has done more, and art less for Willoughby Lake, than for any other spot in Vermont. Its entire length of six or seven miles, with a breadth of from one to one and a half miles, are so many miles of nature's grandest panorama. High mountains of rugged, bold rock, bound the lake on either side. On the easterly side of the lake is a carriage road, hard, smooth, and near enough to the lake on one side so that the spray from the waves, breaking over the rocks in high wind, does away with the necessity for sprinklers made by hand, while on the easterly side the road is bounded by almost perpendicular mountains, with cooling streams forming cascades equal to those more celebrated in the White Mountains: a lake of clear, cold water, with fish uncaught, enough for many generations." Recently an improvement company has been organized at Willoughby Lake for the purpose of building roads and erecting a large hotel.

At Greensboro is Caspian Lake, located at an altitude of 1,500 feet above the sea, and one of the favorite resorts for camping parties. Several cottages have been erected by those who return year after year to spend their vacation here. The water of this lake is from springs, and always cool and clear. It is a favorite home of the speckled trout, with which it is well supplied. The land adjoining this lake is high and dry, and one of the chief inducements to passing some of one's summer here is in the fact that mosquitoes and malaria are unknown.

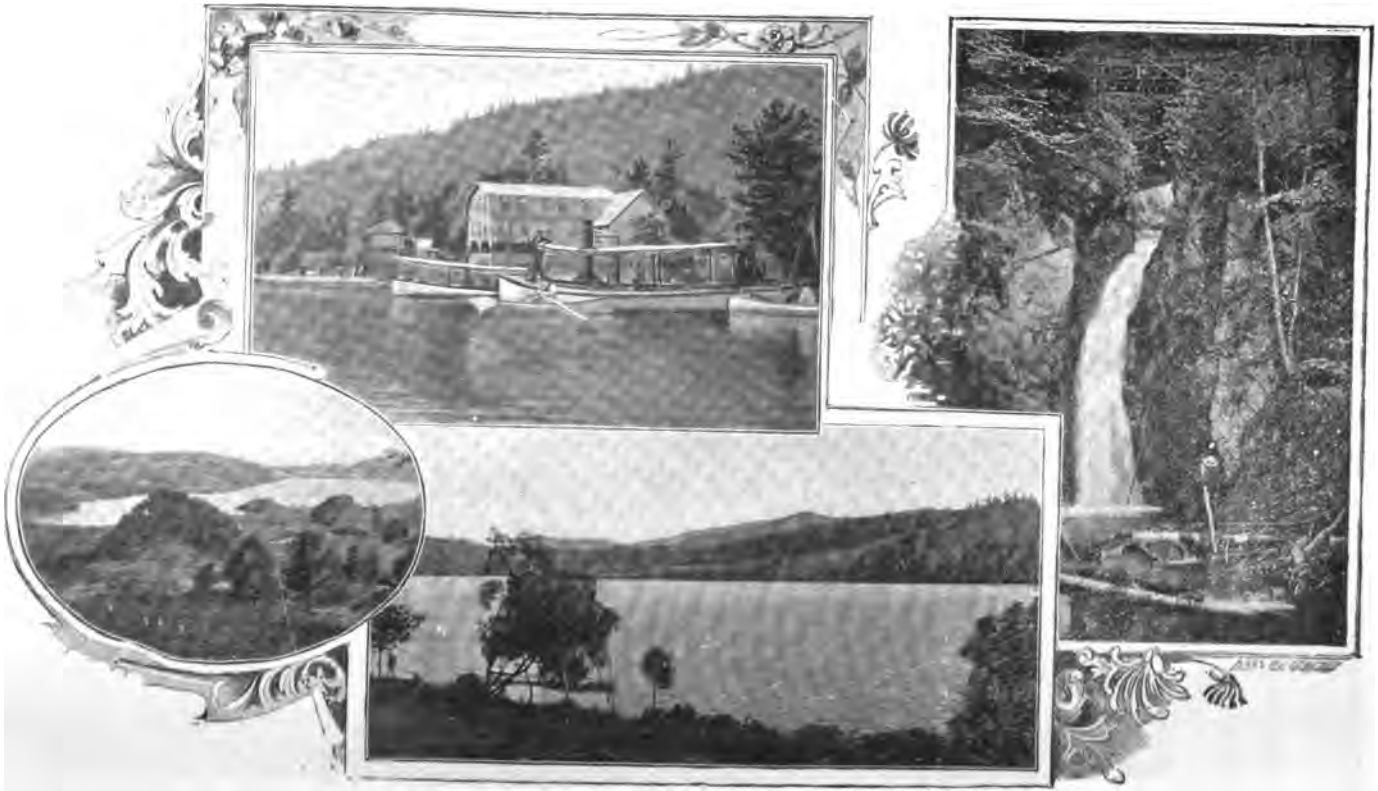
Fairlee Lake, in the town of Fairlee, has also become prominent as a place of resort during the heat of the summer, and the

number of people who spend here a portion of each summer is annually increasing. It is not lacking in any of the attractions in the way of natural scenery that go to make Vermont lakes popular as summer resorts, and has an added advantage of being somewhat nearer Boston, and the cities of New England, than its more northern rivals. Recent investigation on the part of the friends of Capt. Samuel Morey, as to whom belonged the credit of first applying steam to the propulsion of boats, has led to the conclusion that the engine and machinery used by Capt. Morey in his first application of his invention in 1792, was afterwards used to propel a boat upon Fairlee Lake, and was sunk there between the years 1820 and 1825. Efforts to discover this craft have so far been unavailing, but the point where it was sunk is claimed to be known, and is pointed out with much certainty, and the fact that it has not been found is explained by the muddy character of the bottom of the lake at this place, and the boat is supposed to have sunk into the mud beyond reach, having been filled with stones when it was sunk. Vermonters take quite an interest in the work of Capt. Morey with his first steamboat, especially from the fact that in his last days he was a resident of this State; and it appears reasonably conclusive that fourteen or fifteen years before Fulton made his memorable trip from New York to Albany in 1807, Capt. Samuel Morey steamed up the Connecticut river in a craft of his own construction, against the current, at a speed of four miles an hour, and that Fulton afterwards applied the principle of Capt. Morey's craft to the invention for which the world has accorded him credit.

Lake Bomoseen, in Castleton, a body of water containing 15,000 acres, has long been noted as a summer resort, and is well provided with hotel accommodations.

Lake St. Catherine, in Poultney, has also its patrons in seasons of summer travel.

Besides the lakes mentioned, the State has some fifteen or twenty others less widely known, having areas of 1,000 to 5,000 acres each, upon whose shores one may find charming sites for summer cottages, and upon whose waters can be found every opportunity to



VIEWS OF LAKE MOREY.

enjoy the pleasures of boating, or rare inducements to indulge in the angler's art.

Of the mountains, of which no attempt will be made either to describe their own intrinsic beauty or the views of surpassing loveliness that may be seen from their summits, probably Mansfield is best known, and accredited with the highest altitude. Fancy has conceived the summit of this mountain in its irregular outline to resemble the appearance of an old man's face turned upward, and the two prominent peaks of the range, designated as nose and chin, suggest that these features are quite prominent in the face represented. Mansfield Mountain is located in Underhill, and has a passable carriage road to the summit.

South of Mansfield, in the town of Duxbury, is seen the summit of Camel's Hump, which is over 4,000 feet above the sea.

Killington, in Sherburne, which is seen from many portions of the State, ranks next to Mansfield in altitude, and has a place in the memory of nearly every one who has been familiar with Vermont.

Like a lone sentinel on guard stands Ascutney on the eastern border of the State. Up from the banks of the Connecticut river it rises to a height of over 3,300 feet. The pleasant and thriving village of Windsor is at its feet, and large and excellent deposits of granite have been opened upon its side. Unlike most Vermont mountains no trees cover the summit, and, no other mountains being near, an unobstructed view can there be obtained for nearly fifty miles in each direction.

Back from the village of Woodstock is Mount Tom, not of high altitude, but of interest, because at great expense the late Frederick Billings built excellent roads to its top and along its sides, which render it attractive and interesting to tourists.

Six miles below Woodstock, along the course of the Ottaquechee river is found, not a mountain, but a gorge or gulf of considerable notoriety, known as Quechee Gulf. The almost perpendicular sides of this chasm to a depth of nearly 200 feet have served to class it among the points of interest in the State. At the point where the Woodstock railroad crosses this chasm the

bridge has a total length of 200 feet, and the distance from the railroad track to the water is 165 feet.

When it is considered that the entire 157 miles from north to south in Vermont is traversed by a high mountain range, it is easily seen how little of this can be referred to. All Vermonters take pride in their mountains, and Sterling and Pico, Jay Peak, Pisgah, and Equinox, all have features peculiar to themselves, and of interest to the lover of mountain scenery, while rising out of the level country of Addison county, Snake or Grand View Mountain seems higher than many points of greater altitude, and is the pride of the people of the locality, and valued highly for the fine view from its summit.

# REPORT OF THE STATISTICAL SECRETARY ON DAIRY, SHEEP AND MAPLE SUGAR PRODUCTIONS FOR 1892.

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*The first part of section 6, of Act No. 7, of the Laws of 1892, reads as follows:*

"It shall be the duty of the Board to collect authentic statistical information, as full as possible, relating to Agriculture and Agricultural products, Farm and Farm products, the Manufacturing and Mining industries of the State, which, under a separate head, shall form a part of its annual report."

For the purpose of complying as far as possible with the foregoing requirements, the Board of Agriculture decided in the month of March, 1893, to undertake the collection of statistics relating to the dairy, sheep and maple sugar interests of the State. Accordingly, blanks were prepared and sent to the listers of the several towns, with a request that they procure the names of the farmers and the number of cows kept, pounds of butter, cheese or milk produced, the number of sheep and pounds of wool, the number of trees tapped and pounds of maple sugar or gallons of syrup produced by each in their town for the year 1892. In making this request of the listers, the Board were aware that they were asking for a large amount of their time, which it was entirely optional with them to grant or refuse, as there was no provision of law making this a part of their duty.

It was doubtless an oversight by the framers of the law requiring this work to be done, that it was not made the duty of some person in each town to furnish necessary information. This defect of the law should be remedied if this line of work is to be continued. About one-third, or seventy-eight towns, responded to the request for these statistics and sent in returns, more or less complete. Quite a number of listers wrote, saying they could not secure anything reliable to report as the farmers in their towns

kept no accounts; others reported that our blanks did not come in season, and about one-half of the towns made no reply. A portion of the reports that are here found do not include the whole town, as sometimes one lister would send in his report and the others did not, and in other towns, two of the listers reported and one failed to do so. It was my purpose to indicate which towns were only partially reported in the following tables, but upon examination of my returns, I found several cases in which I was uncertain whether the report was full or partial, and having no means of determining, therefore, as I could not be certain in the matter, have let them stand, and the number of animals reported will show how extensive a report has been made.

Many of the reports received gave evidence of much care in their preparation, and of an effort to get, as nearly as possible, reliable data. There was a very general complaint that farmers kept but little account of their business.

Though the statistics, herewith submitted, are much less complete than it was hoped to secure, and so incomplete as to have little value in showing the aggregate results of either dairying, sheep husbandry or maple sugar productions; yet, as showing the comparative results in these different industries in different localities, it is hoped that they may have a value that will justify the labor expended in their preparation.

I have endeavored to make the tables which follow as plain and easily understood as possible, and, that they may not mislead one, have given the number of animals or trees in each town from which the average product is obtained. The dairy product is computed in pounds of butter or its equivalent; when cheese has been made, two pounds have been reckoned as equal to one pound of butter; where milk has been sold, twenty pounds have been reckoned equal to one pound of butter. In cases where the milk sold has not been stated to be for cheese, it has been reckoned as butter. In this way, it is quite likely that the butter product has been credited with some of the milk that was manufactured into cheese, and that the actual cheese product in the towns reported is larger than appears.

In the maple sugar product, the average is given in pounds of

sugar per tree; one gallon of syrup has been called equal to eight pounds of sugar.

With these explanations, it is believed that the tables may be studied for what they contain, and not be misleading as to conclusions to be derived from them.

Attention is called to the very wide difference found in the product of the dairy cow for the different towns, ranging from 92 pounds per cow per year to 259 pounds. In individual dairies the variation is found to be still more, ranging from less than 50 to over 500 pounds per cow per year. I have also ascertained the dairies having a yearly average of 200 pounds per cow and upward, and find 9762 cows that come within this class, or a little less than one-fifth of the cows reported. In ascertaining this number, have been obliged to take the results by dairies, and it is quite likely that there are some cows in each 200 pound dairy that would not produce 200 pounds. It is equally probable that there are many cows in dairies that, as a whole, do not produce 200 pounds, that would have individual records in excess of that amount; and I have let the one class offset the other, and am of the opinion that, for the State, about one cow in five can be classed with 200 pound cows, and over, the other four falling below.

A little study on the wide variation in the product of our dairy cows may do something towards throwing light on that oft recurring and never fully answered question, "does farming pay," and help to understand why it is that there is so wide a difference of opinion in reference to it among farmers. In the tables showing the wool and maple sugar products, there is less variation in results. The spring of 1892 was one of the poorest in recent years for maple sugar, and the average for that year, as here shown, is not supposed to represent more than two-thirds of an average with other years; upon this supposition, it would bring the product of maple sugar in average years at something over three pounds per tree.

In the returns on sheep, the most noticeable feature is the small number reported and the small flocks in which they are found. Only a few of the flocks reported have over fifty, and the total, for

the 78 towns, of 65,000 is scarcely more than is kept on one of the large ranches of the west.

A careful study of the tables here presented will reveal ample occasion for either criticism or commendation, according to the standpoint from which they are judged. A just criticism can be made of the fact that there is so large an element in our dairy stock that must be unprofitable, and of the fact that so many farmers are receiving poor returns for their labor, under the same conditions, with the same opportunities that others have, whose reward is ample and should be fairly satisfactory.

On the other hand, the fact here shown that even our poorest cows to-day are producing nearly as much as the average of twenty years ago, shows an improvement along the line of dairying that is gratifying and full of promise for the future. That over 50,000 cows in the State, taken without selection, are producing an average of 156 pounds of butter per year, certainly marks an improvement within the past few years of no small proportions, and it is with the hope that the improvement here noted will continue, that greater care in selecting and breeding farm animals will prevail, that good care and feed will replace careless management, to the end that all may enjoy the greater profit and added comforts that will follow ; and also with the hope that this imperfect and partial report may be of some assistance to that end.

Respectfully submitted,

VICTOR I. SPEAR,

Statistical Secretary.

## DAIRY STATISTICS.

| | No. of Cows. | Lbs. of But'r. | Lbs. of Ch'se. | Av. lbs. Butter per Cow. | No. of Dairies Reported. | Cows averaging 200 lbs. |
|---|---|---|---|---|---|---|
| **Addison Co.** | | | | | | |
| Middlebury | 140 | 23141 | ..... | 165 | 19 | 25 |
| **Bennington Co.** | | | | | | |
| Landgrove | 187 | 17387 | 1336 | 92 | 31 | ... |
| Pownal | 290 | 27277 | 31440 | 137 | 20 | 37 |
| Readsboro | 257 | 30864 | 843 | 106 | 67 | 14 |
| Sunderland | 163 | 29776 | 250 | 182 | 44 | 79 |
| **Caledonia Co.** | | | | | | |
| Hardwick | 931 | 171282 | ..... | 184 | 104 | 409 |
| Burke | 397 | 63440 | 5230 | 167 | 51 | 149 |
| Newark | 268 | 46846 | 1750 | 181 | 34 | 143 |
| Ryegate | 598 | 155070 | ..... | 259 | 46 | 472 |
| Stannard | 181 | 33750 | ..... | 186 | 32 | 77 |
| Sutton | 315 | 56425 | 600 | 179 | 70 | 189 |
| **Chittenden Co.** | | | | | | |
| Hinesburgh | 2283 | 365280 | ..... | 160 | 136 | 600 |
| Williston | 542 | 101440 | ..... | 187 | 18 | 39 |
| Underhill | 878 | 131700 | ..... | 150 | ... | ... |
| **Essex Co.** | | | | | | |
| Brighton | 140 | 18375 | ..... | 131 | 24 | 10 |
| Maidstone | 176 | 27005 | ..... | 153 | 32 | 11 |
| **Franklin Co.** | | | | | | |
| Fletcher | 546 | 81595 | ..... | 149 | ... | ... |
| Richford | 1814 | 164802 | ..... | 125 | 75 | 36 |
| Franklin | 1489 | 239471 | ..... | 161 | 73 | 19 |
| Fairfax | 1906 | 272727 | ..... | 143 | 117 | 21 |
| **Grand Isle Co.** | | | | | | |
| Grand Isle | 700 | 122500 | ..... | 175 | ... | ... |
| North Hero | 210 | 27167 | ..... | 129 | 46 | 6 |
| South Hero | 290 | 47675 | ..... | 165 | 33 | 32 |
| **Lamoille Co.** | | | | | | |
| Wolcott | 577 | 91200 | ..... | 158 | 52 | 39 |
| Johnson | 903 | 120834 | ..... | 133 | 95 | 6 |
| **Orleans Co.** | | | | | | |
| Westfield | 800 | 75000 | 1500 | 104 | ... | ... |
| Brownington | 817 | 96675 | 42599 | 144 | 108 | 55 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Troy | 1295 | 175202 | 1400 | 136 | 96 | 47 |
| Coventry | 602 | 92165 | ..... | 153 | 66 | 57 |
| Holland | 442 | 59846 | 1501 | 140 | 35 | 11 |
| Irasburgh | 835 | 119615 | ..... | 143 | 72 | 80 |
| Jay | 440 | 56330 | ..... | 128 | 33 | .... |
| Morgan | 800 | 103075 | 2137 | 128 | 73 | 46 |
| Newport | 1353 | 232140 | ..... | 171 | 91 | 176 |
| **Orange Co.** | | | | | | |
| Brookfield | 1096 | 186906 | 7590 | 175 | 116 | 542 |
| Chelsea | 342 | 50748 | 950 | 150 | 80 | 45 |
| Newbury | 1532 | 254823 | 4157 | 168 | 152 | 404 |
| Orange | 342 | 50524 | ..... | 148 | 59 | 54 |
| Randolph | 1003 | 199611 | 1560 | 199 | 85 | 486 |
| Strafford | 331 | 38008 | 160 | 161 | 112 | 80 |
| Washington | 341 | 58025 | ..... | 135 | 98 | 63 |
| Vershire | 245 | 35027 | ..... | 143 | 47 | 32 |
| Fairlee | 137 | 25113 | ..... | 182 | 13 | 8 |
| Williamstown | 763 | 145839 | 880 | 192 | 74 | 350 |
| Topsham | 147 | 19630 | ..... | 134 | 36 | 1 |
| West Fairlee | 85 | 10881 | ..... | 140 | 12 | 11 |
| Braintree | 449 | 84229 | 240 | 188 | 43 | 162 |
| **Rutland Co.** | | | | | | |
| Clarendon | 864 | 53243 | 110627 | 125 | .... | .... |
| Benson | 584 | 108425 | ..... | 185 | 60 | 212 |
| Middletown Springs | 897 | 11650 | 304416 | 133 | 49 | .... |
| Castleton | 210 | 40745 | ..... | 194 | 56 | 89 |
| Ira | 462 | 13250 | 99795 | 137 | 44 | .... |
| Wallingford | 1491 | 88756 | 297000 | 157 | .... | .... |
| Wells | 443 | 58731 | 250 | 133 | 44 | 49 |
| **Washington Co.** | | | | | | |
| Waterbury | 1816 | 227000 | ..... | 125 | .... | .... |
| Berlin | 1185 | 189457 | ..... | 160 | 99 | 320 |
| Cabot | 1138 | 240924 | 250 | 211 | 147 | 620 |
| East Montpelier | 650 | 122855 | 9100 | 196 | 41 | 278 |
| Marshfield | 833 | 148862 | ..... | 178 | 77 | 335 |
| Northfield | 858 | 115370 | 2200 | 135 | 117 | 63 |
| Roxbury | 331 | 50332 | 100 | 157 | 59 | 54 |
| Middlesex | 1120 | 198169 | ..... | 177 | 135 | 381 |
| **Windham Co.** | | | | | | |
| Brattleboro | 740 | 125282 | 600 | 169 | 88 | 137 |
| Brookline | 115 | 17025 | ..... | 148 | 29 | 15 |
| Halifax | 459 | 80285 | 1300 | 176 | 85 | 161 |
| Dummerston | 420 | 57612 | 780 | 138 | 94 | 83 |
| Jamaica | 251 | 32288 | 12000 | 152 | 61 | 43 |
| Stratton | 51 | 8500 | ..... | 166 | 22 | 14 |
| Whitingham | 376 | 63823 | ..... | 170 | 72 | 158 |
| Marlboro | 330 | 42600 | ..... | 129 | 92 | 27 |

| Windsor Co. | | | | | | |
|---|---|---|---|---|---|---|
| Weston | 498 | 64114 | 500 | 129 | 54 | 7 |
| Andover | 512 | 21049 | 70368 | 109 | 71 | 30 |
| Chester | 684 | 106313 | 400 | 156 | 81 | 39 |
| Hartland | 764 | 137777 | 15500 | 190 | 136 | 357 |
| Hartford | 713 | 165193 | 200 | 232 | 60 | 363 |
| Pomfret | 711 | 150689 | 2525 | 213 | 100 | 476 |
| Weathersfield | 814 | 132817 | 4109 | 184 | 103 | 317 |
| Woodstock | 88 | 34400 | 100 | 183 | 23 | 82 |

Whole No. Towns reporting, 78 — Whole No. Dairies reported, 4,838
" " Cows reported, 50,518 — " " lbs. butter " 7,490,228
" " lbs. cheese " 659,416 — Average lbs. butter per cow, 156

## SHEEP AND MAPLE SUGAR STATISTICS.

| | No. of Flocks. | No. of Sugar Orchards. | Average lbs. per Fleece. | Average lbs. per Tree. | No. of Sheep. | Lbs. of Wool. | No. Trees Tapped. | Lbs. of Sugar. | Gallons of Syrup. |
|---|---|---|---|---|---|---|---|---|---|
| **Addison County.** | | | | | | | | | |
| Middlebury | 9 | 5 | 8.2 | 2.5 | 325 | 2662 | 1200 | 2925 | .... |
| Panton | .... | .... | 8.3 | .... | 900 | 7500 | .... | ..... | .... |
| **Bennington Co.** | | | | | | | | | |
| Glastenbury | 1 | 7 | 5.4 | 2.1 | 15 | 81 | 1600 | 1700 | 220 |
| Landgrove | 19 | 16 | 5.4 | 1.4 | 133 | 725 | 6705 | 6625 | 355 |
| Pownal | 16 | 14 | 6.1 | 2.9 | 1355 | 8148 | 3862 | 2160 | 1160 |
| Readsboro | 28 | 25 | 5.2 | 1.5 | 412 | 2131 | 11274 | 8180 | 1190 |
| Searsburg | .... | .... | 8 | 2.1 | 75 | 600 | 2500 | 4000 | 300 |
| Sunderland | 6 | 11 | 5.4 | 2.3 | 490 | 2660 | 4250 | 3588 | 765 |
| **Caledonia Co.** | | | | | | | | | |
| Hardwick | 45 | 47 | 8.1 | 2.1 | 813 | 6579 | 46860 | 95950 | 311 |
| Burke | 37 | 47 | 6.3 | 2.1 | 800 | 5095 | 33815 | 52760 | 2380 |
| Newark | 23 | 26 | 6.6 | 1.6 | 369 | 2454 | 18386 | 27145 | 103 |
| Ryegate | 17 | 20 | 5.5 | 1.7 | 216 | 1183 | 9307 | 13312 | 321 |
| Stannard | 24 | 20 | 6.2 | 1.6 | 282 | 1754 | 11706 | 21391 | 332 |
| Sutton | 33 | 40 | 6.2 | 1.6 | 679 | 4250 | 21292 | 33550 | 160 |
| **Chittenden Co.** | | | | | | | | | |
| Hinesburgh | 27 | 68 | 5 | 1.6 | 626 | 3130 | 24563 | 38100 | 140 |
| Williston | 5 | 17 | 7 | 1.8 | 93 | 650 | 12280 | 21250 | 156 |
| Underhill | .... | .... | 6 | 3 | 279 | 1674 | 21700 | 68100 | .... |
| **Essex Co.** | | | | | | | | | |
| Brighton | 5 | 10 | 5.3 | 1.5 | 38 | 203 | 4175 | 6650 | .... |
| Maidstone | 15 | 17 | 5.9 | 1.8 | 341 | 2023 | 4825 | 8850 | 115 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Franklin Co.** | | | | | | | | | |
| Fletcher | | | 5.9 | 2 | 117 | 672 | 33350 | 66267 | 83 |
| Richford | 24 | 71 | 5.4 | 2.2 | 154 | 830 | 28697 | 61286 | 167 |
| Franklin | 23 | 62 | 5.9 | 1.8 | 226 | 1353 | 54150 | 43207 | 6636 |
| Fairfax | 6 | 86 | 4.9 | 1.8 | 161 | 792 | 48720 | 35217 | 445 |
| **Grand Isle Co.** | | | | | | | | | |
| North Hero | 25 | 3 | 7.9 | 2 | 840 | 6673 | 410 | 820 | |
| South Hero | 30 | 1 | 5.9 | 2.2 | 2427 | 12610 | 500 | 1100 | |
| **Lamoille Co.** | | | | | | | | | |
| Wolcott | 16 | 38 | 5.2 | 3.3 | 302 | 1595 | 20800 | 59200 | 100 |
| Johnson | 36 | 73 | 5.7 | 2.3 | 579 | 3343 | 38798 | 86121 | 53 |
| **Orange Co.** | | | | | | | | | |
| Brookfield | 51 | 106 | 7.4 | 1.7 | 1188 | 8824 | 19138 | 25415 | 1494 |
| Chelsea | 58 | 66 | 6 | 2 | 1660 | 9843 | 24140 | 45525 | 420 |
| Newbury | 73 | 91 | 7 | 1.6 | 2643 | 18540 | 30390 | 37918 | 1481 |
| Orange | 29 | 51 | 5.4 | 1.8 | 1156 | 5996 | 24400 | 39525 | 572 |
| Randolph | 26 | 34 | 6.7 | 1.4 | 635 | 4259 | 15076 | 17930 | 587 |
| Strafford | 68 | 67 | 7.7 | 2 | 2719 | 21159 | 23145 | 42820 | 485 |
| Washington | 65 | 72 | 6.3 | 2.1 | 1456 | 9145 | 25888 | 47000 | 892 |
| Vershire | 20 | 28 | 7.1 | 2 | 1501 | 10664 | 9195 | 18485 | 1254 |
| Fairlee | 10 | 5 | 7.4 | 1.9 | 523 | 3893 | 506 | 925 | |
| Williamstown | 27 | 50 | 6.9 | 2 | 805 | 5596 | 23052 | 41910 | 579 |
| Topsham | 5 | 19 | 4.2 | 2.8 | 105 | 445 | 5975 | 16700 | 47 |
| West Fairlee | 6 | 11 | 6.2 | 1.8 | 259 | 1604 | 2705 | 4750 | 40 |
| Braintree | 25 | 25 | 7.2 | 1.8 | 1570 | 11399 | 8855 | 9120 | 813 |
| **Orleans Co.** | | | | | | | | | |
| Westfield | | | 5 | | 400 | 2000 | | | |
| Brownington | 55 | 64 | 7.3 | 2 | 808 | 5901 | 32945 | 65425 | 180 |
| Troy | 38 | 55 | 5.9 | 1.2 | 719 | 4222 | 30075 | 44928 | 276 |
| Coventry | 47 | 56 | 6.6 | 1.9 | 1606 | 10554 | 25664 | 46597 | 375 |
| Holland | 31 | 39 | 8 | 3 | 320 | 2541 | 15896 | 47225 | 266 |
| Irasburgh | 28 | 58 | 6.6 | 1.9 | 533 | 3513 | 40830 | 43597 | 714 |
| Jay | 8 | 23 | 5.5 | 1.5 | 78 | 431 | 10857 | 15825 | 25 |
| Morgan | 33 | 48 | 7.3 | 2.1 | 2313 | 17051 | 38982 | 80397 | 472 |
| Newport | 27 | 40 | 6.2 | 2.2 | 629 | 3902 | 21325 | 48180 | 20 |
| **Rutland Co.** | | | | | | | | | |
| Benson | 36 | 29 | 6.4 | 1.9 | 2378 | 15085 | 5655 | 3325 | 938 |
| Middletown Springs | 11 | 43 | 5.9 | 3 | 374 | 2192 | 22770 | 15150 | 6660 |
| Castleton | 7 | 9 | 6.6 | 3.2 | 275 | 1834 | 2050 | 6650 | |
| Ira | 8 | 17 | 9.4 | 2.2 | 316 | 2970 | 5765 | 9200 | 460 |
| Wallingford | | | 5.1 | 3.3 | 500 | 2550 | 22500 | 75000 | |
| Wells | 15 | 20 | 6.9 | 2.7 | 324 | 2236 | 3528 | 5850 | 473 |
| **Washington Co.** | | | | | | | | | |
| Waterbury | | | 7.5 | 2.5 | 921 | 6907 | 55250 | 92084 | 5755 |
| Berlin | 33 | 56 | 6.2 | 1.7 | 1025 | 6350 | 21120 | 29985 | 679 |
| Cabot | 47 | 112 | 5.4 | 1.8 | 956 | 5171 | 64730 | 109275 | 700 |
| East Montpelier | 9 | 33 | 7 | 2.5 | 214 | 1505 | 16830 | 36425 | 790 |
| Marshfield | 14 | 60 | 5.8 | 2.3 | 480 | 2783 | 33851 | 71650 | 721 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Northfield | 53 | 46 | 6.1 | 1.5 | 1308 | 8053 | 12085 | 14505 | 520 |
| Roxbury | 28 | 22 | 7.9 | 1.8 | 694 | 5450 | 6260 | 8818 | 382 |
| Middlesex | 39 | 63 | 6.9 | 2.1 | 461 | 3175 | 19612 | 39737 | 345 |
| **Windham Co.** | | | | | | | | | |
| Brattleboro | 20 | 41 | 5.3 | 3.1 | 348 | 1843 | 12765 | 35000 | 605 |
| Brookline | 16 | 18 | 5.6 | 2 | 283 | 1582 | 4635 | 6255 | 408 |
| Halifax | 55 | 67 | 6 | 1.9 | 1115 | 6736 | 48150 | 72400 | 2778 |
| Dummerston | 38 | 40 | 6.3 | 2.1 | 632 | 4032 | 9655 | 16135 | 585 |
| Jamaica | 31 | 31 | 5.3 | 1.6 | 527 | 2806 | 15600 | 19910 | 718 |
| Stratton | 11 | 9 | 6.4 | 1.7 | 102 | 655 | 2204 | 1720 | 257 |
| Whitingham | 50 | 62 | 6 | 1.9 | 584 | 3497 | 29538 | 8625 | 5990 |
| Marlboro | 56 | 54 | 5.3 | 1.8 | 774 | 4074 | 29335 | 47800 | 1090 |
| **Windsor Co.** | | | | | | | | | |
| Weston | 19 | 45 | 5.4 | 2.2 | 277 | 1507 | 15080 | 24560 | 1205 |
| Andover | 32 | 47 | 6.5 | 2.1 | 283 | 1839 | 16219 | 32525 | 202 |
| Chester | 26 | 56 | 5.6 | 2.7 | 659 | 3710 | 14393 | 36775 | 270 |
| Hartland | 43 | 52 | 6.5 | 2.9 | 2759 | 17867 | 14280 | 21983 | 2515 |
| Hartford | 15 | 22 | 7.7 | 2.6 | 1302 | 10117 | 6217 | 3610 | 1615 |
| Pomfret | 51 | 47 | 8.3 | 2.4 | 2832 | 23728 | 13155 | 17601 | 1813 |
| Weathersfield | 46 | 44 | 6.6 | 2.3 | 3196 | 21011 | 9650 | 18770 | 420 |
| Woodstock | 26 | 22 | 8.1 | 2.5 | 1628 | 13208 | 9880 | 7050 | 2275 |

| | | | |
|---|---|---|---|
| No. Flocks reported, | 2035 | No. Sugar Orchards reported, | 2,898 |
| " Sheep " | 65,202 | " Trees " | 1,433,464 |
| " lbs. wool " | 432,321 | " lbs. of Sugar " | 2,472,218 |
| Average Fleece, | 6.64 | " gallons of Syrup " | 67,692 |
| | | Average product per tree, | 2.3 |

## VERMONT INDUSTRIAL RECORD FOR 1892.

The record of Vermont as here presented is taken entirely from reports of the Town Clerks in answer to the following list of questions sent to them toward the close of December, 1892:

1.—Has any new industry been established in your town since January 1, 1892? If so

(*a*) What is the character of the business?.....

(*b*) How much capital invested in it? $.....

(*c*) How much help employed?.....

2.—How many farms have been sold during the year?.....

3.—How many, if any, of these farms were previously unoccupied?

4.—Give the name and post-office address of the owners of any farms, with fair buildings thereon, which are unoccupied either by owner or tenant.

Of the total number of towns, 234 have reported. Of the towns failing to report, all except one are small, and from which there was likely to be little to report, and, though a full report would doubtless have added somewhat to the figures given, it may be considered, I think, fairly complete and accurate.

In 1892, the Board followed up the work of the previous year, and issued 10,000 copies of a pamphlet containing some of the same matter as the 1891 issue, and in addition descriptions of several localities possessed of special advantages for the summer tourist and the seeker for a locality in which to buy or build a summer home. This pamphlet also described several farms that were for sale, but only a small number. As this work was gratuitous on the part of the Board and carried on with small financial support, it was necessary that those advertising farms should bear a portion of the expense, and this necessity reduced materially the number described.

The Legislature of 1892 so far approved of what the Board had been doing on their own account as to make provisions to have it

continued, and among other things required a "complete report as to unoccupied farms." Agreeably to this requirement, this pamphlet has been prepared. Every owner of an unoccupied farm in the State, whose name could be obtained, has been invited to put his property in this list, and more than half of the total number reported have complied. These descriptions are all made by the owners, and certified to as correct, and these farms are to be on the market at the terms offered for one year, unless sooner disposed of.

Correspondence in regard to any of the farms here described should be directed to the owners. Questions in regard to any particular locality, its advantages and disadvantages will be answered as fully and correctly as possible if directed to the undersigned.

Thanks are due the Town Clerks who so cheerfully assisted in this matter, and I wish to say that nearly all the reports received gave evidence of care in their preparation.

The total number of farms sold during the year is 1,914. Of this number 192 were previously unoccupied. As compared with 1891, an increase of 150 farm sales is shown.

The following table shows the Counties in which the sales were made, and as a means of comparison the sales for 1891 are also given:

| | SOLD IN 1892 | SOLD IN 1891 |
|---|---|---|
| Addison, | 133 | 129 |
| Bennington, | 56 | 56 |
| Caledonia, | 127 | 125 |
| Chittenden, | 68 | 84 |
| Essex, | 86 | 46 |
| Franklin, | 172 | 130 |
| Grand Isle, | 4 | 2 |
| Lamoille, | 95 | 67 |
| Orange, | 213 | 218 |
| Orleans, | 231 | 159 |
| Rutland, | 106 | 93 |
| Washington, | 184 | 199 |
| Windham, | 144 | 168 |
| Windsor, | 295 | 288 |

It will be seen on inspection that sales have increased in nine Counties, decreased in four, and remained the same in one. The sales of unoccupied farms have been, in the various Counties, as follows :

Addison 2, Bennington 6, Caledonia 27, Essex 4, Lamoille 9, Orange 32, Orleans 11, Rutland 9, Washington 28, Windham 41, Windsor 23.

The total number of farms reported in answer to question 4 is 376. Of this number Addison County has 15, Bennington 26, Caledonia 48, Essex 7, Lamoille 7, Orange 57, Orleans 22, Rutland 18, Washington 29, Windham 94, Windsor 53. Chittenden, Grand Isle and Franklin Counties report no unoccupied farms.

Many of the farms reported as without tenants are so from the fact that a tenant has moved away and none has been found to fill the place. Quite a number are tenantless from the fact that an estate is being settled.

Of the 200 farms described in the following pages, 45 have been unoccupied only a year or less, and many others less than two years. Of the 376 farms reported as unoccupied, it is believed that not over 200 are cases of long standing, the remainder being temporarily without tenants through a variety of causes. This estimate does not include tracts of land where farm buildings have once been but which passed out of the list of farming lands years ago and are now returning to their original and proper use, to the growing of forest trees.

To the owner of each of the 376 unoccupied farms reported, a blank was sent, asking for a description of the same, together with price and terms of payment, if for sale, with the offer to publish the same in this catalogue free of charge. Twenty-five replies were received, saying the farm was not for sale. About two hundred sent their descriptions, which will be found in the following pages. From the remainder no reply was received. We believe, therefore, that the farms here described practically cover what the State has to offer. That many farms have escaped the knowledge of the Town Clerks when making their returns is probable, and that some who desire to sell have neglected to send their description is also, perhaps, true, but from the thorough way the investigation

was made, and the free use of valuable advertising that was offered, it hardly seems possible that the cases omitted can be very large.

## NEW INDUSTRIES.

The reports show that $813,500 have been invested in new industries, and in the enlarging of plants already in operation. Several large additions are reported as having been made, of which the cost was unknown and no estimate was made. It also appears that these new enterprises are giving employment to 1,100 persons. As compared with the report of one year ago it is seen that there has been $72,500 more capital gone into new business during 1892 than for 1891; also that these new enterprises are employing 1,100 persons against 2,197 for the new industries of 1891, a less number by 1,097. The distribution of these new industries by counties is as follows :

| | CAPITAL. | EMPLOYEES. |
|---|---|---|
| Addison | $109,000 | 60 |
| Bennington | 5,000 | 24 |
| Caledonia | 43,000 | 61 |
| Chittenden | 69,000 | 127 |
| Essex | 9,000 | 18 |
| Grand Isle | 3 | 2 |
| Franklin | 14,000 | 58 |
| Lamoille | 3 | 2 |
| Orange | 33,900 | 68 |
| Orleans | 190,000 | 164 |
| Rutland | 11,000 | 18 |
| Washington | 19,000 | 88 |
| Windham | 22,500 | 74 |
| Windsor | 288,000 | 340 |

The field covered by this new business is wide and the nature of the enterprises varied.

Creameries have been established at Vergennes, Danville, Shelburne, two at Westford, Lunenburgh, Corinth, Fairlee, two at Newbury, Chelsea, Topsham, Mount Tabor and Newfane, with an

investment of $33,000, and employing 37 persons. Cheese factories at Bridport, Guildhall and Jamaica, $8,500 invested and 6 persons employed. Electric light at Bristol and Hartford, with an investment of $35,000, and employing 8 persons. Granite at Manchester, Hardwick, Williamstown, Newport, Waterbury, East Montpelier and Danville, with $124,000 invested and 180 persons employed.

Five thousand dollars has been invested in new marble quarrying at Brandon and Manchester and 9 persons employed. Corn canning factories at Norwich and Westminster called for $13,000 capital and employ 80 persons in their season. Saw and shingle mills at Wheelock, Fayston, Stratton, Windham and Norwich have invested $31,000 and employ 99 persons. Machine shops at Troy, Swanton and St. Johnsbury with $29,000 invested and 21 persons employed. Butter boxes, bobbin, spool and shingle mills at Marshfield, Manchester, Pittsford, Montgomery, Victory and Canaan have invested $21,500 and employ 94 persons. At Bellows Falls $75,000 of new capital in paper making with 20 men employed. At Westmore the Willoughby Lake Improvement Co. has organized with a capital of $60,000 for the purpose of building a summer resort. At Ludlow $60,000 has been invested in a new woolen mill that is giving employment to 60 persons. Burlington and Montpelier have invested $13,000 and employ 35 persons in working brass. Burlington also has a match factory with $15,000 invested and employing 80 persons, and a new lumber company with $25,000 capital and 20 persons employed. Milton has a plant for the manufacture of excelsior, with a capital of $15,000 and 6 persons employed. Moretown has invested $2,000 and employs 6 men in the manufacture of chair stock, Randolph a new screen factory representing an investment of $15,000 capital and 30 men employed, Barton a factory for ladies' muslin underwear with $25,000 invested and 100 persons employed. Bethel has increased the capital and working force of its shoe factory, and Brattleboro its jelly factory. Enosburgh is just undertaking the quarrying of slate. Glover has an overall factory. Bennington has increased the capacity of its hosiery and jersey mills. Pittsford has opened a new marble quarry. Clarendon has increased its marble quar-

rying, Richford its foundry plant and Enosburgh its evaporator works.

The summer hotels at Woodstock and Lake Dunmore were completed last season and involved an investment of capital largely in excess of last year's estimates.

Of the towns in which a new industry for 1893 is regarded as assured are Peacham and Waitsfield that expect creameries, Burlington a large canning establishment, Canaan a furniture factory that will call for an investment of $75,000 and employ 100 persons, and Brighton that feels "practically sure" of a shirt factory that will employ 500 persons. Other towns report an interest in new enterprises, but do not state just what is expected.

An inspection of the foregoing figures reveals the fact that quite an increase of invested capital for 1892 over 1891 is giving employment to only about half as many persons. This is largely due to the fact that in the past year more has been invested in enterprises of a permanent character, where a considerable sum has been required to erect buildings and the force of help at present employed is small, but likely to increase. This is well illustrated in the report of the granite industry for 1891 and 1892. In 1891 $36,000 of new capital was invested and 210 persons employed; for 1892, $124,000 of capital was invested and only 180 persons employed in the new work. The investments as noted being made were for buildings and permanent fixtures. It is but just to say that the granite industry was very much retarded by the labor troubles of 1892, and several localities that expected to undertake work in this direction were retarded from doing so.

Taken as a whole it appears that for 1892 more farms were sold, more industries undertaken, and more capital invested in them than in the previous year, which indicates a healthy condition of both the agricultural and manufacturing interests of the State, and goes far to show that those who have foreseen for the State an improved condition of its industrial affairs have judged correctly. Capital is seeking investment in local enterprises, and where so invested it has averaged to be profitable. Agriculture is seeking to improve methods and adapt itself to the necessities of the times. Creameries are proving to be a valuable aid to the farmer, and the number

started in the past year is good evidence that the fact is understood and applied.

From what acquaintance it has been possible to obtain of the State, by personal visits and by correspondence, there seems to be little excuse for complaining, but good and substantial reasons for an earnest effort to help forward all the various enterprises that are under way, to have faith in the State, and a belief that the upward course has but fairly begun, and that an era of prosperity is before us, the extent of which is to be largely dependent upon the individual efforts of our citizens.

# FARM SALES AND NEW INDUSTRIES IN VERMONT IN 1893.

From the reports of town clerks, made for the year 1893, the following compilations have been made with reference to the sale of farms and the undertaking of new business enterprises in the State.

During the year 1,982 farms have been sold, of which 180 were previously unoccupied. This, as compared with 1892, shows an increase in the total sales of 68, as compared with 1891, an increase of 218. The sale by counties for the three years, 1891, 1892 and 1893 have been as follows:

| | 1893 | 1892 | 1891 |
|---|---|---|---|
| Addison | 160 | 133 | 129 |
| Bennington | 81 | 56 | 56 |
| Caledonia | 146 | 127 | 125 |
| Chittenden | 120 | 68 | 84 |
| Essex | 56 | 86 | 46 |
| Franklin | 130 | 172 | 130 |
| Grand Isle | 11 | 4 | 2 |
| Lamoille | 109 | 95 | 67 |
| Orange | 219 | 213 | 218 |
| Orleans | 223 | 231 | 159 |
| Rutland | 111 | 106 | 93 |
| Washington | 163 | 184 | 199 |
| Windham | 185 | 144 | 168 |
| Windsor | 308 | 295 | 288 |
| Total | 1,982 | 1,914 | 1,764 |

Inquiries were addressed to the owners of the "List of Unoccupied Farms" issued by the Board of Agriculture in May, 1893, and from the replies received, it appears that, of the 170 farms described in the list, 38 have been sold, seven have been withdrawn from the markets, eight are offered at a lower price than last year,

and five are held at an advanced price. Inquiries were also made of all the town clerks and the owners of the advertised farms as to the value of real estate in their localities at the present time, as compared with one and two years ago. One hundred and eighty-nine answers were returned to this inquiry, of which 116 gave the value as unchanged, 49 that it was higher, and 24 that it was lower. This difference in opinion, quite likely, is due to the difference in the standpoint of the observer, and is likely to be a fairly correct estimate on the subject for the different localities.

Of the farms advertised by the Board, 26 owners reported that they had had no inquiry for their property. All of the others had received one or more letters from the advertising, and a total of 326 inquiries had been received. Of the total number of unoccupied farms sold during the year, the distribution in the several counties is as follows :

| | |
|---|---|
| Addison | 3 |
| Bennington | 4 |
| Caledonia | 19 |
| Chittenden | 8 |
| Essex | 8 |
| Lamoille | 5 |
| Orange | 18 |
| Orleans | 11 |
| Rutland | 19 |
| Washington | 8 |
| Windham | 37 |
| Windsor | 40 |
| Total | 180 |

## NEW INDUSTRIES.

The reports show that $401,800 have been invested in new enterprises that employ 600 persons. As compared with the report of 1892, it appears that less than half as much capital has gone into new business for the year 1893 as in the preceding year, and that

only little over half as much employment is afforded. The comparison of the last three years is as follows: Capital invested in new business in 1893, $401,800; in 1892, $813,500; in 1891, $741,000; number of persons employed in new business in 1893, 600; in 1892, 1,100; in 1891, 2,197. The distribution of these enterprises through the State by counties is as follows:

| | CAPITAL. | EMPLOYEES. |
|---|---|---|
| Addison | $ 700 | 1 |
| Bennington | 12,000 | 40 |
| Caledonia | 25,700 | 21 |
| Chittenden | 7,000 | 79 |
| Essex | 50,000 | 100 |
| Franklin | 37,000 | 35 |
| Grand Isle | | |
| Lamoille | | |
| Orange | 20,700 | 28 |
| Orleans | 39,000 | 59 |
| Rutland | 121,400 | 83 |
| Washington | 37,000 | 65 |
| Windham | 10,000 | 10 |
| Windsor | 43,500 | 79 |

The enterprises established have been quite varied in character, and it appears that 18 new creameries have been included, with $58,900 invested, and employing 38 men; six new shops for manufacturing butter packages have been put in operation, with $18,000 invested, and 50 men employed; four saw and shingle mills, with $11,800 invested, and 62 men employed; two gristmills, with $4,600 invested, and 3 men employed; two canning factories, with $4,500 invested, and 20 men employed; two electric light plants, with $120,000 invested, and 11 men employed; two shops for getting out chair stock, with $5,500 invested, and 16 men employed; two shirt factories, with $55,000 invested, and 109 persons employed; three shops for making bobbins and spools, with $19,000 invested, and 41 persons employed; three new marble plants, with $9,000 invested and 39 persons employed. Besides these there is a new investment in granite of $9,000, and there are 36 men

employed; a new sash and door shop, with $20,000 invested, and 5 men employed; $5,000 were invested in fruit evaporating, and 20 persons employed; a new machine shop, with $25,000 invested; $2,500 were invested in a new limekiln; $2,000 in the manufacture of broom handles; $4,000 in washing machines and clothes dryers; one new cheese factory, with $1,500 invested; $5,000 are invested and 75 persons are employed in the manufacture of window screens; and $10,000 were invested in a new scale plant.

As will have been noticed in the table, giving the distribution by counties, the State has been pretty well covered by these new enterprises, and, as will have been noted also, the establishments are nearly all small. The electric light plant at West Haven, costing $100,000 and a shirt factory at Brighton, costing $50,000, includes over a third of all the capital invested, and this accounts, in a measure, for the falling off in the total investment as compared with preceding years. The small amount invested in new granite work and the absence of investments in summer hotels also accounts for a very large portion of the falling off noted. In view of the fact that the year 1893 was marked by so great a depression in all investments of business, it would perhaps be as proper to undertake to explain how any business had been started, as to account for the shrinkage which is found. That Vermont has been favored by a degree of prosperity, while other sections have been badly depressed, is strong evidence as to the value of investments in the State, and suggests forcibly the advantage that would follow a policy of investing more Vermont capital at home.

It should not be overlooked that Vermont owes its enviable position to the fact that its interests are largely agricultural, and its income so largely derived from supplying food products. As these products have yielded fair prices, the farmers in turn have been good buyers of manufactured goods, thus completing the circle and giving a fair degree of prosperity in all departments. The inquiry for farms in the State has been larger the past year than in either of the preceding years that I have had charge of this department. A large number of these inquiries came from persons who have been employed in the cities and find their occupation gone or their salaries reduced. The west also furnishes a large inquiry for

Vermont farms, and the steadily increasing sales made from year to year is the best possible evidence that can be furnished to show that the low price of our farming lands, together with the natural advantages possessed for profitable farming, is being appreciated, and that Vermont is not only a "good State to be born in," but a good State to return to, after the experiment of other localities has been tried.

VICTOR I. SPEAR,
Statistical Sec'y of Board of Agriculture,
Braintree, Vermont.

April 14, 1894.

## CREAMERIES AND CHEESE FACTORIES.

| | cows. |
|---|---|
| Beaver Glen Cheese Factory | |
| H. P. Palmer, New Haven. | |
| Elgin Spring and Allendale Separators | |
| Fred E. Sears & Co., Vergennes. | |
| Rock Dale Separator | 275 |
| Daniel H. Orvis, South Starksboro. | |
| Baldwin Creek Separator in Starksboro | 250 |
| Evarts & Eastman, Bristol. | |
| James Bros.' Separator in Bridport | 275 |
| James Bros., Weybridge. | |
| Champlain Valley Cheese Factory | 225 |
| Edward Nichols, Bridport. | |
| The Addison Cheese Factory in Addison | 175 |
| East Monkton Creamery. Cream gathering | 350 |
| Eastman & Thomas. | |
| Two Separators in East Monkton | |
| M. F. Allen, North Ferrisburgh. | |
| Two Separators in Orwell | 300 |
| J. L. Douglas, Salisbury. | |
| Orwell Cheese Factory | 550 |
| Stock Co., Orwell. | |
| Bristol Cold Spring Separator | 1800 |
| Evarts & Eastman, Bristol. | |
| Two Separators in Starksboro | |
| Evarts & Eastman, Bristol. | |
| Separator | |
| J. L. Douglas, Cornwall. | |
| Vergennes Creamery | |
| A. D. Willard, Ferrisburgh. | |
| New Haven Mills Creamery | |
| Evarts & Eastman, Bristol. | |

| | cows. |
|---|---|
| Separator in Lincoln | 75 |
| Evarts & Eastman, Bristol. | |
| Champlain Valley Creamery. Separator and cream gathering | 1200 |
| A. D. Willard, North Ferrisburgh. | |
| Allen Creamery. Separator and cream gathering | |
| Cream Hill Separator in Shoreham | 325 |
| Middlebury Creamery. Separator | |
| Evarts & Eastman, Bristol. | |
| Green Mountain Cheese Factory in Winhall | 125 |
| Green Mountain Cheese Co., Bondville. | |
| Pownal Valley Cheese Factory | 150 |
| D. S. Gardner, North Pownal. | |
| Hoosic Valley Cheese Factory | |
| David Gardner, Pownal. | |
| Rose Cheese Factory (Joseph Bonneville) | 213 |
| East Rupert Dairy Association Cheese Factory | 250 |
| Rupert " " " " | 400 |
| Denio Cheese Company | 275 |
| W. B. Denio, West Rupert. | |
| Peru Cheese Factory | 200 |
| Stock Company. | |
| Manchester Cheese Factory | 400 |
| Stock Co., John Bottes, Secretary. | |
| Dorset Cheese Factory | 490 |
| Stock Co., Dorset, Vt. | |
| East Dorset Cheese Association | 430 |
| Burke Hollow Cheese Factory | |
| W. H. Vaughn, Burke, Vt. | |
| Lamoille Valley Creamery | 800 |
| Lamoille Valley Creamery Association, East Hardwick. | |
| Lyndonville Creamery. Cream gathering | 1400 |
| Lyndonville Creamery Association. | |
| So. Peacham Creamery Co. Separator | 500 |

| | cows. |
|---|---|
| West Waterford Creamery | 200 |
| E. P. & M. B. Carpenter, W. Waterford. | |
| Danville Creamery. Separator and cream gathering | 1000 |
| Barnet Creamery Association. Separator and cream gathering Stock Co | |
| Jersey Hill Creamery. Separator | 475 |
| East Ryegate Creamery | 250 |
| South Ryegate Creamery | 350 |
| H. S. Johnson's Cheese Factory | 300 |
| Williston, Vt. | |
| Valley Creamery. Separator | 489 |
| H. F. Hull, Hinesburgh. | |
| Valley Cheese Factory | 400 |
| C. J. Peck, Agt. | |
| "Valley Falls" Separator | 1000 |
| McDonough Cheese Factory | 600 |
| McDonough & Son, Hinesburgh. | |
| W. B. Johnson's Creamery at Colchester. Separator | 500 |
| W. B. Johnson, Essex Junction. | |
| Clover Dale Butter Factory at Westford | 400 |
| A. E. Robinson, North Underhill. | |
| Separator | 375 |
| Franklin Co. Creamery Association | |
| Separator | 375 |
| W. B. Johnson, Essex Junction | |
| Union Cheese Factory Co. | 400 |
| Heman W. Rice, Westford. | |
| Franklin Co. Separator at Underhill | 300 |
| West Bolton Separator | 125 |
| H. C. Gleason, Richmond. | |
| Shelburne Creamery. Separator | 400 |
| A. D. Willard & Co., Shelburne. | |
| Separator at St. George | 300 |
| W. B. Johnson, Essex Junction. | |
| Williston Creamery. Separator | |

| | cows. |
|---|---|
| H. S. Johnson Cheese Factory | |
| H. S. Johnson, Williston. | |
| The W. B. Johnson Creamery. Separator | 500 |
| W. B. Johnson, Essex Junction. | |
| Brown's River Cheese Factory at Essex | 400 |
| Franklin Co. Creamery Asso. 5 Separators, at Milton | 200 |
| W. E. Allen, St. Albans. | |
| Willard & Allen Creamery. Separator at Charlotte | |
| Willard & Allen, Ferrisburgh. | |
| Guildhall Cheese Factory | |
| B. Frank Brown, Concord, N. H. | |
| White Mountain Cheese Factory | |
| B. Frank Brown, Concord, N. H. | |
| Beaver Creamery at Fairfax | 360 |
| Gardner Murphy, Boston, Mass. | |
| Four Franklin Co. Separators at Richford | 1000 |
| Two Franklin Co. Separators at Fletcher | |
| Franklin Co. Separator at Highgate | 250 |
| Franklin Separator at Sheldon | 700 |
| Stock Co., St. Albans, Vt. | |
| Cheese Factory | 50 |
| John Riley, Sheldon, Vt. | |
| Green Valley Creamery | 200 |
| Gardner Murphy & Co., Swanton. | |
| Five Franklin Co. Separators at Franklin | |
| Five Franklin Co. Separators at Fairfax ..... each | 500 |
| Franklin Separator at St. Albans | 15000 |
| T. M. Deal, Manager. | |
| North Georgia Creamery. Separator | 1200 |
| Gardner Murphy & Co., Boston. | |
| O. B. Johnson Creamery. Separator | 400 |
| O. B. Johnson, Georgia. | |
| Franklin Co. Creamery } Separators. | |
| Gardner Murphy & Co. Creamery } | |
| Gardner Murphy & Co., Boston. | |
| Franklin Co. Separator at Bakersfield | 400 |

| | cows. |
|---|---|
| Four Franklin Co. Separators at Enosburgh | |
| West Enosburgh Cheese Factory | 300 |
| A. P. Croft, W. Enosburgh. | |
| Grand Isle Separator | 1000 |
| Grand Isle Creamery Co., Pearl, Vt. | |
| So. Hero Creamery Co. Separator | 165 |
| Creamery Co., So. Hero. | |
| Grand Isle Creamery Co. at Alburgh. Separator | 675 |
| W. R. Boynton & Co., Boston, Mass. | |
| C. L. McMahon Creamery. Sep. and cream gathering | 400 |
| Three Franklin Co. Separators at Cambridge | 600 |
| The "Champion" Creamery at Hyde Park. Separator and cream gathering | 800 |
| Austin Belknap, Boston, Mass. | |
| "Lake Morey." Separator | 300 |
| F. A. Messer, Fairlee, Vt. | |
| Riverside Creamery at Newbury. Separator | |
| W. S. Hale, Keene, N. H. | |
| Vershire Creamery Co. Separator | 450 |
| Thetford Creamery. Separator | 1,075 |
| C. Brigham & Co. Creamery at Randolph. Separator and cream gathering | |
| C. Brigham & Co., Boston. | |
| Newbury Village Separator at Newbury | |
| M. L. Brock, W. Newbury. | |
| Wells River Creamery Co. | |
| T. H. Baldwin, Wells River. | |
| Topsham Creamery Co., Green Mountain Creamery Co. at Topsham, } Separators | 500 |
| Orange Co. Creamery Co. at Chelsea. Separator | 400 |
| "Lake Side" Separator at West Fairlee | 125 |
| Fred E. Kibbee, Fairlee, Vt. | |
| Bradford Creamery Co. Separator | 400 |
| Corinth Creamery Co. East Corinth Creamery Co. } Separators | 400 |
| Stock Companies. | |
| Vershire Creamery Co. Separator | 400 |

| | cows. |
|---|---|
| Brigham Creamery Co. Separator in Brookfield | 275 |
| Brigham & Co., Boston, Mass. | |
| J. L. Morse. Cheese factory | 25 |
| Strafford. Separator | 250 |
| Thetford and No. Thetford. Separator | 400 |
| Brigham & Co. Separator at Braintree | |
| Brigham & Co., Boston. | |
| Orleans Co. Creamery. Separator | 250 |
| W. J. Burnap, North Troy. | |
| "Eureka" Separator | 500 |
| F. I. Marvin, Derby. | |
| "Willow Dale" Cheese factory | 350 |
| Allen Vincent, Brownington. | |
| "Eureka" Separator at Charleston | 300 |
| Marvin Bros., West Charleston | 300 |
| "Northern Vermont." Separator at Charleston | |
| W. T. Lyman, Waitsfield, Vt. | |
| "Lake Side." Separator at Craftsbury | |
| James McEwen, East Craftsbury. | |
| "Columbia." Separator | 300 |
| B. P. & A. B. Shannon, Craftsbury, Vt. | |
| "Nettle Brook." Separator at Albany | 300 |
| A. L. Aldrich, Albany. | |
| "Willoughby" Creamery. Cream gathering | 125 |
| J. S. Turnball, Barton Landing. | |
| "Crystal Lake." Cream gathering and separator | 125 |
| W. W. Pearson, Barton. | |
| One Separator at Lowell | 500 |
| O. B. Landon, Johnson. | |
| Cheese Factory at Irasburgh | 400 |
| Joseph E. Tatro, Irasburgh. | |
| Westfield Green Mt. Cheese Factory | 350 |
| Stock Company. | |
| "Meadow Brook" at Glover. Cream gathering and sep. | 800 |
| W. N. Aldrich & Co., West Glover. | |

| | cows. |
|---|---|
| "Phœnix." Separator at Holland | 300 |
| F. F. Caswell, Derby, Vt. | |
| Brigham & Co. Separator at Mt. Tabor | 200 |
| C. Brigham & Co., Boston. | |
| Riverside Cheese Factory at Ira | 300 |
| Lewisville Cheese Factory | 250 |
| Lyman Farrar, Wells, Vt. | |
| Separator at Wallingford | 466 |
| C. Brigham & Co., Boston. | |
| Pearl Cheese Factory | 275 |
| Sarah Leffitt, So. Wallingford. | |
| Chilson Cheese Factory | 250 |
| E. J. Chilson, E. Wallingford. | |
| Castleton Cheese Factory | 500 |
| Frank Rowe, Middlebury. | |
| Gleason Cheese Factory | |
| H. C. Gleason, Shrewsbury. | |
| The Bates Cheese Factory | |
| Two Separators at Danby | 600 |
| C. Brigham & Co., Boston. | |
| Hillside Cheese Factory | 400 |
| R. H. Faxon, Danby. | |
| East Poultney Cheese Mfg. Co | 400 |
| Mark Lewis, E. Poultney. | |
| One Separator at Brandon | 250 |
| Otter Creek Creamery. Separator and cream gathering | 1000 |
| A. Jones, Sudbury. | |
| "Clover Dale" Separator at Chittenden | 200 |
| Wm. Mullen, Worcester, Mass. | |
| The Tarbellville Cheese Factory | 400 |
| Marshal Tarbell. | |
| A. W. Crowley. Cheese Factory | 330 |
| A. W. Crowley, Healdville. | |
| The Hoskins Cheese Factory | 225 |
| Wm. B. & J. P. Hoskins, Healdville. | |

| | COWS. |
|---|---|
| The Mt. Holly Cheese Factory | 350 |
| W. D. Dean, Mt. Holly. | |
| The J. D. S. Packer Cheese Factory | 233 |
| J. D. S. Packer, Mt. Holly. | |
| Marshal Separator at Clarendon | 300 |
| W. W. Jenks, No. Clarendon. | |
| Wescott's Cheese Factory | 250 |
| W. H. Wescott. | |
| Rutland Cheese Factory | 200 |
| Stock Company. | |
| Rutland Co. Creamery Co. Separator | |
| Pittsford. | |
| Pittsford Creamery Co. Separator | |
| Pittsford Mills. | |
| Douglass Cheese Factory | 50 |
| B. J. Douglass, Pittsford. | |
| "Riverside" Cheese Factory | 300 |
| George Corliss, Ira. | |
| King's Creamery. Separator | 100 |
| C. M. King, Benson. | |
| Champlain Valley Separator | 500 |
| L. H. & H. K. Sheldon, Fair Haven. | |
| Pittsfield Cheese Factory | 200 |
| Stock Company. | |
| "Flower Brook" Cheese Factory | 300 |
| F. L. Hulett, Pawlet. | |
| Blakely Cheese Factory | 400 |
| Frank Blakely, Pawlet. | |
| "Maple Grove" Cheese Factory | 200 |
| Wm. Leach, Pawlet. | |
| John Hill Cheese Factory | |
| John Hill, Marshfield. | |
| One Separator at Plainfield | |
| One Separator at E. Montpelier | |
| Hopkins' Creamery. Separator | 100 |
| Daniel Hopkins, Waterbury Center. | |

| | COWS. |
|---|---|
| Northfield Creamery. Separator | 350 |
| Wm. Mullen, Worcester, Mass. | |
| "Capitol" Creamery, Montpelier. Separator | |
| Francis Batchelder, Boston, Mass. | |
| "Mad River Valley" Separator | 600 |
| Skinner & Fitch, Waitsfield. | |
| "Cold Spring" Separator, Moretown | 500 |
| Chas. F. Eddy, Waitsfield. | |
| Cabot Creamery Co. Separator | 300 |
| "North River" Creamery at Whitingham. Cream gathering | 400 |
| North River Creamery Association, Jacksonville. | |
| Jamaica Cheese Factory | 175 |
| Globe Cheese Factory at Londonderry | 200 |
| O. P. Dunn, So. Londonderry. | |
| West River Cheese Factory | 100 |
| Londonderry. | |
| Westminister Valley Creamery Asso. Cream gathering | |
| Rockingham Cheese Factory | |
| Stock Co., Rockingham. | |
| Grafton Cheese Factory | 150 |
| Windham Co. Creamery at Newfane. Separator | 600 |
| Stock Co. E. C. Benedict, Pres. | |
| Deerfield Valley Creamery at Wilmington. Cream gathering | 475 |
| Brattleboro Creamery. Cream gathering | |
| Wardsboro. Cream Separator | |
| Gassetts Cheese Factory | 175 |
| P. R. Earle, Chester. | |
| Chester Cheese Co. | 300 |
| M. H. Bemis, Worcester, Mass. | |
| Eagle Cheese Co. | 225 |
| Cavendish. | |
| Enterprise Cheese Factory, Hartland | 300 |
| Norwich Separator | 800 |
| Leonard's Cheese Factory at Andover | 140 |
| C. S. Leonard, Simonsville. | |

| | cows. |
|---|---|
| West Windsor Cheese Factory | 300 |
| Weston Cheese Factory | 500 |
| P. H. Fuller, Agent. | |
| E. Barnard Cheese Co. | |
| West Hartford Creamery. Separator | 290 |
| Hartland Creamery. Separator | 200 |
| Arthur E. Spear, Hartland. | |
| Andover Dairymen's Asso. Cheese Factory | 175 |
| West Bridgewater Cheese Factory | 150 |
| Daily Hollow Cheese Factory | 150 |
| Bridgewater. | |
| Sharon Creamery. Separator and cream gathering | 220 |
| Stock Co. | |
| Springfield Creamery Co. Cream gathering | 450 |
| Plymouth Cheese Factory | 225 |
| Plymouth. | |
| Ludlow Creamery | |
| E. C. Pinney, Ludlow. | |
| South Reading Cheese Factory | |
| W. E. Aldrich. | |
| Woodstock Creamery. Cream gathering | 500 |
| Co-operative. | |
| Middle Branch Separator | |
| Aaron Storrs, E. Bethel. | |

## A LIST OF FAIRS HELD IN 1894.

Addison County—Middlebury, September 11–13.
Charles A. Dana, Secretary.

Battenkill Valley Industrial Society—Manchester Center, September 11–13. D. K. Simonds, Secretary.

Brandon Fair—Brandon, September 18–19.
W. F. Scott, Secretary.

Caledonia County—St. Johnsbury, September 11–13.
Arthur F. Stone, Secretary.

Caledonia North—Lyndonville, September 25–26.
E. M. Campbell, Secretary.

Champlain Valley Fair—Burlington, September 4–7.
E. W. J. Hawkins, Secretary.

*Franklin County—Sheldon Junction, September 5–7.
C. A. Oliver, Secretary.

*Lamoille Valley Fair Ground Co.—Morrisville, September 18–20.
A. A. Niles, Secretary.

Rutland County—Rutland, October 2–4.
F. H. Chapman, Secretary.

Ryegate and Wells River Valley—So. Ryegate, September 19–20.
T. A. Meader, Secretary.

Springfield Agricultural Society—Springfield, September 11–12.
R. W. Whitney, Secretary.

State Fair—White River Junction, September 4–7.
E. J. Wallace, Secretary.

Union Agricultural Society—North Tunbridge, October 2–3.
Wallace W. Swan, Secretary.

Valley Fair—Brattleboro, September 26–27.
W. S. McKenney, Secretary.

Waits River Valley—East Corinth, August 28–30.
W. L. Crofts, Secretary.

Western Vermont—Fair Haven, September 25–27.
H. K. Sheldon, Secretary.

Windsor County—Woodstock, September 25–27.
John S. Eaton, Secretary.

Winooski Valley—Waterbury, September 11–13.
E. G. Hooker, Secretary.

Vermont Association of Road and Trotting Horse Breeders —Rutland, August 28–30. D. C. Brown, Secretary.

White River Agricultural Society—Bethel, September 10–12.

# SCALE OF POINTS.

The following Scales of Points have been gathered from the different sources of authority on the various subjects, and are recommended to the agricultural public as a guide in the various branches to enable them to aim at a standard type of perfection on the farm, also to have the same standard of perfection used at the fairs in the State as a guide in making the awards. This system of judging has been used at the fairs in some of the Eastern States during this season and seems to meet the approval of exhibitors.

The Scale of Points for Vegetables and plates for the same, and many of the Scales of Points for live stock were kindly loaned by the Massachusetts Board of Agriculture :

## SCALE OF POINTS FOR JUDGING HORSES.

ESTABLISHED BY THE VERMONT STATE BOARD OF AGRICULTURE FOR USE AT FAIRS.

| STRUCTURAL POINTS. | No. of Points | Score. |
|---|---|---|
| Eyes prominent, clear, intelligent and expressive | 4 | |
| Head wide between the eyes, ears set well apart, of fair size and indicating energy, clean-cut jowl, large, delicate nostrils, well rounded lower jaw and fine firm lips | 7 | |
| Neck symmetrical in length and proportions, graceful and clean-cut at throttle | 5 | |
| Shoulders flat and oblique for drivers, well rounded and straight for draft, strong at base and well finished at withers | 3 | |
| Chest deep, full and prominent, good width | 3 | |
| Forearm well formed, strong and muscular | 3 | |
| Barrel, for drivers, deep and well rounded, with long, springy ribs; round with short ribs, for draft. Deep through the loins. Back short and strong | 3 | |
| Coupling smooth, strong and extending well forward over the point of the hips | 5 | |
| Quarters symmetrical, not too sloping, well rounded and muscular | 4 | |
| Tail long, full, bone straight, well set and fine in quality | 2 | |
| Stifles and gaskins muscular, with good length of bone between joints, for drivers, and short for draft | 4 | |
| Hock sound, strong, without too great an angle, free from meatiness | 7 | |
| Knees. Neither sprung nor calf-kneed, broad, straight and strong | 6 | |
| Cannons flat, broad, smooth, fine in quality yet with abundant substance | 3 | |
| Pasterns muscular, good length, sound, and for drivers at an angle of forty-five degrees; for draft, shorter and stronger | 3 | |
| Feet medium height, round, free from contracted heels, of good material, with full elastic frog | 8 | |
| Color. Solid bay or seal brown the standard | 4 | |
| Size. Fifteen two to sixteen hands, and well proportioned, the ideal standard | 6 | |
| Coat glossy, fine and short | 2 | |
| Substance | 4 | |
| Symmetry | 4 | |
| Action easy, elastic, pure, straight and even | 6 | |
| Style. Position of horse when standing, and carriage when in motion | 4 | |
| Total on structure | 100 | |

## SCALE OF POINTS FOR JUDGING AYRSHIRE CATTLE.

RECOMMENDED BY THE AYRSHIRE BREEDERS' ASSOCIATION, AND ESTABLISHED BY THE VERMONT STATE BOARD OF AGRICULTURE FOR USE AT FAIRS.

### BULLS.

The points desirable in the female are generally so in the male, but must, of course, be attended with that masculine character which is inseparable from a strong and vigorous constitution. Even a certain degree of coarseness is admissible; but then it must be so exclusively of masculine description as never to be discovered in a female of his get.

| STRUCTURAL POINTS. | No. of Points. | Score. |
|---|---|---|
| The Head of the bull may be shorter than that of the cow, but the frontal bone should be broad, the muzzle good size, throat nearly free from hanging folds, eyes full. The horns should have an upward turn, with sufficient size at the base to indicate strength of constitution | 10 | |
| Neck of medium length, somewhat arched, and large in those muscles which indicate power and strength | 10 | |
| Forequarters. Shoulders close to the body, without any hollow space behind; chest broad, brisket deep and well developed, but not too large | 7 | |
| Back short and straight; spine sufficiently defined but not in the same degree as in the cow; ribs well sprung, and body deep in the flanks | 10 | |
| Hindquarters long, broad and straight; hip bones wide apart; pelvis long, broad and straight; tail set on a level with the back; thighs deep and broad | 10 | |
| Scrotum large, with well developed teats in front | 7 | |
| Legs short in proportion to size, joints firm. Hind legs well apart, and not to cross in walking | 5 | |
| Skin yellow, soft, elastic, and of medium thickness | 10 | |
| Color. Red of any shade, brown or white, or a mixture of these, each color being distinctly defined | 3 | |
| Average live weight at maturity about 1,500 pounds | 10 | |
| General appearance, including style and movement | 15 | |
| Escutcheon, large and fine development | 3 | |
| Perfection | 100 | |

## COWS.

| STRUCTURAL POINTS. | No. of Points. | Score. |
|---|---|---|
| Head short; forehead wide; nose fine between the muzzle and eyes; muzzle large; eyes full and lively; horns wide set on, inclining upwards | 10 | ..... |
| Neck moderately long, and straight from the head to the top of the shoulder, free from loose skin on the under side, fine at its junction with the head, and enlarging symmetrically towards the shoulders | 5 | ..... |
| Forequarters. Shoulders sloping; withers fine; chest sufficiently broad and deep to insure constitution; brisket and whole forequarters light, the cow gradually increasing in depth and width backwards | 5 | ..... |
| Back short and straight; spine well defined, especially at the shoulders; short ribs arched; the body deep at the flanks | 10 | ..... |
| Hindquarters long, broad and straight; hookbones wide apart, and not overlaid with fat; thighs deep and broad; tail long, slender, and set on level with the back | 8 | ..... |
| Udder capacious and not fleshy, hindpart broad and firmly attached to the body, the sole nearly level and extending well forward; milk-veins about udder and abdomen well developed; the teats from 2½ to 3 inches in length, equal in thickness,—the thickness being in proportion to the length,—hanging perpendicularly; their distance apart at the sides should be equal to one-third of the length of the vessel, and across to about one-half of the breadth | 30 | ..... |
| Legs short in proportion to size, the bones fine, the joints firm | 3 | ..... |
| Skin yellow, soft and elastic, and covered with soft, close, woolly hair | 5 | ..... |
| Color. Red of any shade, brown or white, or a mixture of these—each color being distinctly defined | 3 | ..... |
| Average live weight, in full milk, about 1000 pounds | 8 | ..... |
| General appearance, including style and movement | 10 | ..... |
| Escutcheon, large and fine development | 3 | ..... |
| Perfection | 100 | ..... |

## SCALE OF POINTS FOR JUDGING GUERNSEY CATTLE.

RECOMMENDED BY THE AMERICAN GUERNSEY CATTLE CLUB AND ESTABLISHED BY THE VERMONT STATE BOARD OF AGRICULTURE FOR USE AT FAIRS.

| STRUCTURAL POINTS. | No. of Points. | Score. |
|---|---|---|
| Skin deep yellow in ear, on end of bone of tail, at base of horn, on udder, teats and body generally | 20 | |
| Skin loose, mellow, with fine soft hair | 10 | |
| Escutcheon wide on thighs, high and broad, with thigh ovals | 8 | |
| Milk veins long and prominent | 6 | |
| Udder full in front | 6 | |
| Udder full and well up behind | 8 | |
| Udder large, but not fleshy | 4 | |
| Udder teats squarely placed | 4 | |
| Udder teats of good size | 4 | |
| Size for the breed | 5 | |
| Not too light bone | 1 | |
| Barrel round, and deep at flank | 4 | |
| Hips and loins wide | 2 | |
| Rump long and broad | 2 | |
| Thighs and withers thin | 2 | |
| Back level to setting on of tail | 3 | |
| Throat clean, with small dewlap | 1 | |
| Legs not too long, with hocks well apart in walking | 2 | |
| Tail long and thin | 1 | |
| Horns curved and not coarse | 2 | |
| Head rather long and fine, with quiet and gentle expression | 3 | |
| General appearance | 2 | |
| Perfection | 100 | |
| For bulls deduct 18 counts for udder. | | |

## SCALE OF POINTS FOR JUDGING DEVON CATTLE.

RECOMMENDED BY THE AMERICAN DEVON CATTLE CLUB AND ESTABLISHED BY THE VERMONT STATE BOARD OF AGRICULTURE FOR USE AT FAIRS.

| STRUCTURAL POINTS. COW. | No. of Points. | Score. |
|---|---|---|
| Head moderately long, with a broad, indented forehead tapering considerably towards the nortrils; the nose of a flesh color, nostrils high and open; the jaws clean; the eye bright, lively and prominent, and surrounded by a flesh-colored ring; throat clean; ears thin; the expression gentle and intelligent; horns matching, spreading and gracefully turned up, of a waxy color, tipped with a darker shade | 8 | |
| Neck. Upper line short, fine at head, widening and deep at withers, and strongly set to the shoulders | 4 | |
| Shoulders fine, flat and sloping, with strong arms and firm joints | 4 | |
| Chest deep, broad and somewhat circular in character | 8 | |
| Ribs well sprung from the backbone, nicely arched, deep, with flanks fully developed | 8 | |
| Back straight and level from the withers to the setting on of the tail; loin broad and full; hips and rump of medium width, and on a level with the back | 16 | |
| Hindquarters deep, thick and square | 8 | |
| Udder not fleshy, coming well forward in line with the belly and well up behind; teats moderately large and squarely placed | 20 | |
| Tail well set on at a right angle with the back, tapering, with a switch of white or roan hair and reaching to the hocks | 2 | |
| Legs straight, squarely placed when viewed from behind, not to cross or sweep in walking; hoof well formed | 4 | |
| Skin moderately thick and mellow, covered with an abundant coat of rich hair of a red color; no white spot admissible except the udder | 8 | |
| Size. Minimum weight at 3 years old, 1,000 pounds | 2 | |
| General appearance, as indicated by stylish and quick movement, form, constitution and vigor, and the under line as nearly as possible parallel with the line of the back | 8 | |
| Perfection | 100 | |

## BULL.

| STRUCTURAL POINTS. | No. of Points. | Score. |
|---|---|---|
| Head masculine, full and broad, tapering toward the nose, which should be flesh-colored; nostrils high and open, muzzle broad; eyes full and placid and surrounded with flesh-colored rings; ears of medium size and thickness; horns of medium size, growing at right angles from the head, or slightly elevated, waxy at the base, tipped with a darker shade | 10 | |
| Cheek full and broad at root of tongue; throat clean | 2 | |
| Neck of medium length and muscular, widening from the head to the shoulders, and strongly set on | 4 | |
| Shoulders fine, flat, sloping and well fleshed; arms strong, with firm joints | 6 | |
| Chest deep, broad and somewhat circular | 10 | |
| Ribs well sprung from the backbone, nicely arched, deep, with flanks fully developed | 10 | |
| Back straight and level from the withers to the setting on of the tail, loin broad and full, hips and rump of medium width and on a level with the back | 20 | |
| Hindquarters deep, thick and square | 12 | |
| Tail well set on, at a right angle with the back, tapering, with a switch of white or roan hair and reaching the hocks | 2 | |
| Legs, short, straight and squarely placed when viewed from behind, not to cross or sweep in walking, hoof well formed | 4 | |
| Skin moderately thick and mellow, covered with an abundant coat of rich hair of a red color; no white spot admissible unless arcund the purse | 8 | |
| Size. Minimum weight at 3 years old, 1,400 pounds | 4 | |
| General appearance, as indicated by stylish and quick movement, form, constitution and vigor, and the under line as nearly as possible parallel with the line of the back | 8 | |
| Perfection | 100 | |

## SCALE OF POINTS FOR JUDGING HOLSTEIN-FRIESIAN CATTLE.

RECOMMENDED BY THE HOLSTEIN-FRIESIAN ASSOCIATION AND ESTABLISHED BY THE VERMONT STATE BOARD OF AGRICULTURE FOR USE AT FAIRS.

| STRUCTURAL POINTS FOR BULLS. | No. of Points. | Score. |
|---|---|---|
| Head showing full vigor, elegant in contour | 2 | |
| Forehead broad between the eyes, dishing | 2 | |
| Face of medium length, clean and trim, especially under the eyes; the bridge of the nose straight; the muzzle broad | 2 | |
| Ears of medium size; of fine texture; the hair plentiful and soft; the secretions oily and abundant | 1 | |
| Eyes large, full, mild, bright | 2 | |
| Horns short, of medium size at base, gradually diminishing toward tips, oval, inclining forward, moderately curved inward, of fine texture, in appearance waxy | 2 | |
| Neck long, finely crested (if the animal is mature), fine and clean at juncture with the head, nearly free from dewlap, strongly and smoothly joined to shoulders | 5 | |
| Shoulders of medium height, of medium thickness, and smoothly rounded at tops, broad and full at sides, smooth over front | 4 | |
| Chest deep and low, well filled and smooth in the brisket, broad between the forearms, full in the foreflanks (or through at the heart) | 8 | |
| Crops comparatively full, nearly level with the shoulders | 4 | |
| Chine straight, broadly developed, open | 3 | |
| Barrel well rounded, with large abdomen, strongly and trimly held up | 6 | |
| Loin and hips broad, level or nearly level between hook-bones, level and strong laterally, spreading from the chine broadly and nearly level, the hook-bones fairly prominent | 5 | |
| Rump long, broad, high, nearly level laterally, comparatively full above the thurl | 5 | |
| Thurl high, broad | 4 | |
| Quarters deep, broad, straight behind, wide and full at sides, open and well arched in the twist | 5 | |
| Flanks deep, full | 2 | |
| Legs comparatively short, clean and nearly straight, wide apart, firmly and squarely set under the body; arms wide, strong and tapering; feet of medium size, round, solid and deep | 6 | |
| Tail large at base, the setting well back, tapering finely to switch, the end of the bone reaching to hocks or below, the switch full | 2 | |
| Hair and handling. Hair healthful in appearance, fine, soft and furry; skin of medium thickness and loose, mellow under the hand; the secretions oily, abundant and of a rich brown or yellow color | 10 | |
| Mammary veins large, full, entering large or numerous orifices; double extension, with special developments, such as forks, branches, connections, etc., | 10 | |
| Rudimentary teats large, well placed | 2 | |
| Escutcheon largest, finest | 8 | |
| Perfection | 100 | |

General Vigor. For deficiency inspectors shall discredit from the total received, not to exceed 8 points.

General symmetry and fineness. For deficiency inspectors shall discredit from the total received, not to exceed 8 points.

General style and bearing. For deficiency inspectors shall discredit from the total received, not to exceed 8 points.

| STRUCTURAL POINTS FOR COWS. | No. of Points. | Score. |
|---|---|---|
| Head decidedly feminine in appearance, fine in contour | 2 | |
| Forehead broad between the eyes, dishing | 2 | |
| Face of medium length, clean and trim, especially under the eyes, showing facial veins; the bridge of the nose straight; the muzzle broad | 2 | |
| Ears of medium size, of fine texture; the hair plentiful and soft, the secretions oily and abundant | 1 | |
| Eyes large, full, mild, bright | 2 | |
| Horns small, tapering finely toward the tips, set moderately narrow at base, oval, inclining forward, well bent inward, of fine texture, in appearance waxy | 2 | |
| Neck long, fine and clean at juncture with the head, free from dewlap, evenly and smoothly joined to shoulders | 4 | |
| Shoulders slightly lower than hips, fine and even over tops, moderately broad and full at sides | 3 | |
| Chest of moderate depth and lowness, smooth and moderately full in the brisket, full at the foreflanks (or through at the heart) | 6 | |
| Crops moderately full | 2 | |
| Chine straight, broadly developed, open | 3 | |
| Barrel of wedge shape, well rounded, with a large abdomen, trimly held up (in judging the last item age must be considered) | 4 | |
| Loin and hips broad, level or nearly level between hook-bones, level and strong laterally, spreading from chine broadly and nearly level, hook-bones fairly prominent | 5 | |
| Rump long, high, broad, with roomy pelvis, nearly level laterally, comparatively full above the thurl | 5 | |
| Thurl high, broad | 4 | |
| Quarters deep, straight behind, roomy in the twist, wide, and moderately full at the sides | 4 | |
| Flanks deep, comparatively full | 2 | |
| Legs comparatively short, clean and nearly straight, wide apart, firmly and squarely set under the body: feet of medium size, round, solid and deep | 5 | |
| Tail large at base, the setting well back, tapering finely to switch, the end of the bone reaching to hocks or below, the switch full | 2 | |
| Hair and handling. Hair healthful in appearance, fine, soft and furry; the skin of medium thickness and loose, mellow under the hand; the secretions oily, abundant and of a rich brown or yellow color | 10 | |
| Mammary veins very large, very crooked, (age must be taken into consideration in judging of size and crookedness), entering very large or numerous orifices, double extension, with special developments, such as branches, connections, etc | 10 | |
| Udder and teats very capacious, very flexible, quarters even, nearly filling the space in the rear below the twist and extending well forward in front, broad and well held up; teats well formed, wide apart, plumb and of convenient size | 12 | |
| Escutcheon largest, finest | 8 | |
| Perfection | 100 | |

General vigor. For deficiency inspectors shall discredit from the total received, not to exceed 8 points.

General symmetry and fineness. For deficiency inspectors shall discredit from the total received not to exceed 8 points.

General style and bearing. For deficiency inspectors shall discredit from the total received, not to exceed 8 points.

## SCALE OF POINTS FOR JUDGING JERSEY CATTLE.

RECOMMENDED BY THE AMERICAN JERSEY CATTLE CLUB AND ESTABLISHED BY THE VERMONT STATE BOARD OF AGRICULTURE FOR USE AT FAIRS.

| STRUCTURAL POINTS. FOR COWS. | No. of Points. | Score. |
|---|---|---|
| Head small and lean; face dished, broad between the eyes and narrow between the horns | 2 | |
| Eyes full and placid; horns small, crumpled and amber colored | 1 | |
| Neck thin, rather long, with clean throat, and not heavy at the shoulders | 8 | |
| Back level to the setting on of tail | 1 | |
| Broad across the loins | 6 | |
| Barrel long, hooped, broad and deep at the flank | 10 | |
| Hips wide apart; rump long | 10 | |
| Legs short | 2 | |
| Tail fine, reaching the hocks, with good switch | 1 | |
| Color and mellowness of hide; inside of ears yellow | 5 | |
| Fore udder full in form and not fleshy | 13 | |
| Hind udder full in form and well up behind | 11 | |
| Teats rather large, wide apart, and squarely placed | 10 | |
| Milk veins prominent | 5 | |
| Disposition quiet | 5 | |
| General appearance and apparent constitution | 10 | |
| Perfection | 100 | |

In judging heifers, omit udder points and milk veins.

### FOR BULLS.

The same scale of points shall be used in judging bulls, omitting udder points and milk veins, and making due allowance for masculinity; but when bulls are exhibited with their progeny, in a separate class, add 30 counts for progeny.

## SCALE OF POINTS FOR JUDGING SHORTHORN CATTLE.

ESTABLISHED BY THE VERMONT STATE BOARD OF AGRICULTURE FOR USE AT FAIRS.

| STRUCTURAL POINTS.—COWS. | No. of Points. | Score. |
|---|---|---|
| Head small, lean and bony, tapering to the muzzle | 3 | |
| Face somewhat long, the fleshy portion of the nose of a light, delicate color | 2 | |
| Eye is of great significance, and should be prominent, bright and clear,—"prominent" from an accumulation of "adeps" in the back part of its socket, which indicates a tendency to lay on fat, "bright" as an evidence of a good disposition, "clear" as a guarantee of the animal's health; whereas a dull, sluggish eye belongs to a slow feeder, and a wild, restless eye betrays an unquiet, fitful temper | 2 | |
| Horns light in substance and waxy in color, and symmetrically set on the head; the ear large, thin, and with considerable action | 1 | |
| Neck rather short than long, tapering to the head, clean in the throat, and full at its base, thus covering and filling out the points of the shoulders | 2 | |
| Chest broad from point to point of the shoulders, deep from the anterior dorsal vertebra to the floor of the sternum, and both round and full just back of the elbows, sometimes designated by the phrase "thick through the heart." These are unquestionably the most important points in every animal, as constitution must depend on their perfect development, and the ample room thus afforded for the free action of the heart and lungs | 14 | |
| Brisket, however deep or projecting, must not be confounded with capacity of chest, for though a very attractive and selling point, it, in reality, adds nothing to the space within, however it may increase the girth without. It is, in fact, nothing more nor less than a muscular adipose substance, attached to the anterior portion of the sternum, or breast-bone, and thence extending itself back. This form, however, of the brisket indicates a disposition to lay on fat generally throughout the frame, and in this point of view is valuable | 5 | |
| Shoulder, where weight, as in the Shorthorn, is the object, should be somewhat upright and of good width at the points, with the blade-bone just sufficiently curved to blend its upper portion smoothly with the crops | 4 | |
| Crops must be full and level with the shoulders and back, and is, perhaps, one of the most difficult points to breed right in a Shorthorn | 8 | |
| Back, loin and hips should be broad and wide, forming a straight and even line from the neck to the setting on of the tail, the hips or hucks round and well covered | 8 | |
| Rumps laid up high, with plenty of flesh on their extremities | 5 | |
| Pelvis should be large, indicated by the width of the hips, (as already mentioned) and the breadth of the twist | 2 | |

## COWS—CONCLUDED.

| | No. of Points. | Score. |
|---|---|---|
| Twist should be so well filled out in its "seam" as to form nearly an even and wide plain between the thighs | 3 | |
| Quarters long, straight, and well developed downwards | 5 | |
| Carcass round, the ribs nearly circular, and extending well back | 4 | |
| Flanks deep, wide, and full in proportion to condition | 3 | |
| Legs short, straight, and standing square with the body | 2 | |
| Plates of the belly strong, and thus preserving nearly a straight underline | 3 | |
| Tail flat and broad at its root, but fine in its cord, and placed high up and on a level with the rumps | 2 | |
| Carriage of the animal gives style and beauty; the walk should be square and the step quick, the head up | 2 | |
| Quality. On this the thriftiness, the feeding properties and the value of the animal depend; and upon the touch of this quality rests, in a good measure, the grazier's and the butcher's judgment. If the "touch" be good, some deficiency of form may be excused; but if it be hard and stiff, nothing can compensate for so unpromising a feature. In raising the skin from the body, between the thumb and finger, it should have a soft, flexible and substantial feel, and when beneath the outspread hand it should move easily with it, and under it, as though resting on a soft, elastic, cellular substance; which, however, becomes firmer as the animal ripens. A thin papery skin is objectionable, more especially in a cold climate | 15 | |
| Coat should be thick, short and mossy, with longer hair in winter, fine, soft and glossy in summer | 2 | |
| Udder pliable and thin in its texture, reaching well forward, roomy behind, and the teats standing wide apart, and of convenient size | 3 | |
| Perfection | 100 | |

## BULLS.

As regards the male animal it is only necessary to remark that the points desirable in the female are generally so in the male, but must, of course, be attended by that masculine character which is inseparable from a strong, vigorous constitution. Even a certain degree of coarseness is admissible, but then it must be so exclusively of a masculine description as never to be discovered in the females of his get.

In contra-distinction to the cow, the head of the bull may be shorter, the frontal-bone broader, and the occipital flat and stronger, that it may receive and sustain the horn, and this latter may be excused if a little heavy at the base, so its upward form, its quality and color be right. Neither is the looseness of the skin attached to and depending from the under jaw to be deemed other than a feature of the sex, provided it is not extended beyond the bone, but leaves the gullet and throat clean and free from dewlap.

The upper portion of the neck should be full and muscular, for it is an indication of strength, power and constitution. The spine should be strong, the bones of the loin long and broad, and the whole muscular system wide and thoroughly developed over the entire frame.

## SCALE OF POINTS FOR JUDGING SHEEP.

ESTABLISHED BY THE VERMONT STATE BOARD OF AGRICULTURE FOR USE AT FAIRS.

| STRUCTURAL POINTS. | No. of Points. | Score. |
|---|---|---|
| Type, to include color and characteristics of the breed | 10 | |
| Fleece | 10 | |
| Head | 10 | |
| Face | 8 | |
| Neck | 6 | |
| Shoulders | 10 | |
| Chest | 6 | |
| Back | 10 | |
| Quarters | 10 | |
| Flanks | 6 | |
| Legs | 6 | |
| Feet | 8 | |
| Perfection | 100 | |

## STANDARD OF EXCELLENCE OF HAMPSHIRE-DOWN SHEEP.

RECOMMENDED BY THE HAMPSHIRE-DOWN ASSOCIATION, AND ESTABLISHED BY THE VERMONT STATE BOARD OF AGRICULTURE FOR USE AT FAIRS.

### HEAD AND LEGS.

Head—moderately large, but not coarse; well covered with wool on forehead and cheeks.
Nostrils—wide.
Color—(head and legs)—dark-brown or black.
Eyes—Prominent and lustrous.
Ears—Moderately long and thin, and dark-brown or black color.
Legs—Well under outside of body, straight with good size of bone, black.

### NECK, SHOULDERS AND CHEST.

Neck—A regular taper from shoulders to head, without any hollow in front of shoulders, set high up on body.
Shoulders—Sloping, full, and not higher than the line of back and neck.
Chest—Deep and full in the heart place, with breast prominent and full.

### BODY.

Back—Straight with full spring of rib.
Loin—Wide and straight, without depression in front of hips.
Quarters—Long from hips to rump, without sloping, and deep in thigh. Broad in hips and rump, with full hams. Inside of thighs, full.

### SCALE OF POINTS, HAMPSHIRE-DOWN SHEEP.

| | |
|---|---|
| Head—Size and shape, 5; ears and eyes, 2; color, 5; legs and feet, 3 | 15 |
| Neck, Shoulders and Breast—Neck, 5; shoulders, 10; chest and breast, 15 | 30 |
| Body—Back and loin, 15; rib, 5 | 20 |
| Quarters—Length, 10; width, 10; twist, 5 | 25 |
| Wool—Forehead and cheeks, 2; belly, well covered, 3; quality, 5 | 10 |
| Total | 100 |

## SCALE OF POINTS FOR JUDGING SMALL YORKSHIRE PIGS.

ESTABLISHED BY THE VERMONT STATE BOARD OF AGRICULTURE FOR USE AT FAIRS.

| STRUCTURAL POINTS. | No. of Points. | Score. |
|---|---|---|
| Head and fineness of ears. Head shall be short; nose short and straight and not turn up; ears small, erect and fine skin | 30 | |
| Back and body. Back shall be straight, of the same width at hind quarters as at the shoulders; body deep, skin fine, hair white and not coarse, free from black spots or any scabby skin spots | 40 | |
| Legs and fineness of bone. Legs shall be rather short, standing well apart, and not knock-kneed | 20 | |
| Symmetry of parts, showing a good profile with short head, deep body and straight back | 10 | |
| Perfection | 100 | |

In judging Medium Yorkshires allow about one-third larger proportion, but the main points the same.

In judging Chester Whites give preference to medium length of head; ears may lop; other points the same.

In judging Berkshires allow one-third larger proportions. The head and nose may be a little longer. Color mostly black, with white on feet, face and tip of tail.

In judging Poland China allow same proportions as Berkshire. Color dark, spotted or black. Ears fine and drooping.

In judging Essex, color black, other points nearly same as Small Yorkshires.

## SCALE OF POINTS FOR JUDGING POULTRY.

No scale of points has been established by the Vermont State Board of Agriculture for judging poultry, but it is recommended that poultry premiums be awarded in accordance with the American standard of perfection, as adopted by the American Poultry Association. Societies that do not have access to the above named standard might use the following :

| STRUCTURAL POINTS. | No. of Points. | Score. |
|---|---|---|
| Symmetry | 10 | |
| Weight | 8 | |
| Condition | 6 | |
| Head | 6 | |
| Comb | 10 | |
| Ear lobes | 6 | |
| Neck | 10 | |
| Back | 8 | |
| Breast | 10 | |
| Body | 6 | |
| Wings | 8 | |
| Tail | 6 | |
| Legs and Toes | 6 | |
| Perfection | 100 | |

## SCALE OF POINTS FOR JUDGING FRUITS.

ESTABLISHED BY THE VERMONT STATE BOARD OF AGRICULTURE FOR USE AT FAIRS.

| | No. of Points. | Score. |
|---|---|---|
| Quality | 20 | ..... |
| Form | 15 | ..... |
| Color | 15 | ..... |
| Size | 10 | ..... |
| Uniformity in size | 20 | ..... |
| Freedom from imperfections | 20 | ..... |
| Perfection | 100 | ..... |

## SCALE OF POINTS FOR JUDGING VEGETABLES.

ESTABLISHED BY THE VERMONT STATE BOARD OF AGRICULTURE, FOR USE BY THE AGRICULTURAL SOCIETIES OF THE STATE AT THEIR ANNUAL FAIRS.

The scale of points for vegetables is founded upon the standard of the Boston market, which is as high as any standard in the world.

It is strongly recommended that societies require exhibitors to exhibit a uniform number or measure of specimens.

POTATO (Rose).

| | No. of Points. | Score. |
|---|---|---|
| Size—Should be 2½ inches wide and 4 inches long for perfection | 30 | .... |
| Form—Should be according to engraving | 30 | .... |
| Smoothness—Free from deep pits, warts or excrescences | 30 | .... |
| Quality—Fresh appearance, freedom from coarseness, and bright color | 10 | .... |
| | 100 | |

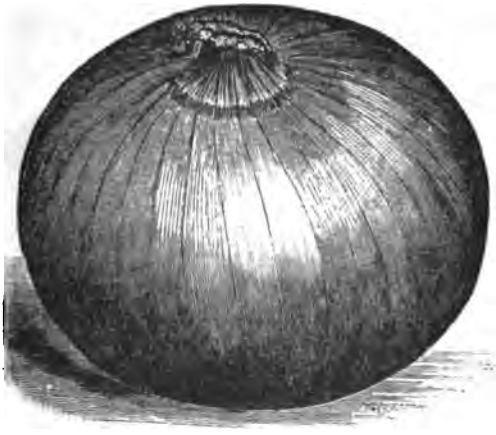
POTATO (Hebron).

| | No. of Points. | Score. |
|---|---|---|
| Size—Should be 4½ inches long and 3 inches wide for perfection | 30 | .... |
| Form—Should be according to engraving | 30 | .... |
| Smoothness—Free from deep pits, warts or excrescences | 30 | .... |
| Quality—Fresh appearance, freedom from coarseness, and bright color | 10 | .... |
| | 100 | |

ONION.

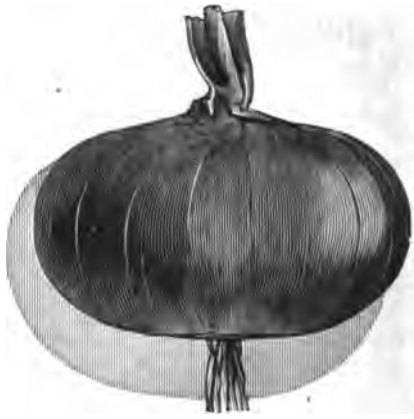
| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 50 | .... |
| Size—Should be not less than 2½ inches in diameter | 20 | .... |
| Color—Should be greenish white | 20 | .... |
| Quality—Ripeness, firmness and small neck | 10 | .... |
| | 100 | .... |

ONION (Danvers Yellow).



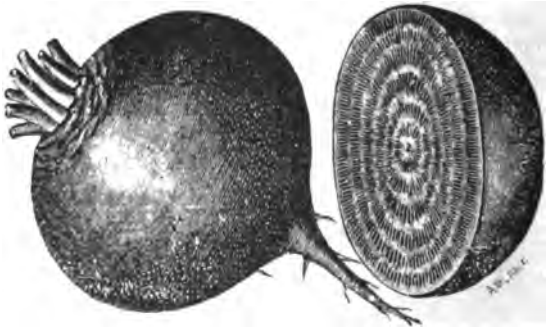
| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 50 | .... |
| Size—Should be not less than 3 inches in diameter | 20 | .... |
| Color—Should be dark straw color | 20 | .... |
| Quality—Ripeness, firmness and small neck | 10 | .... |
| | 100 | .... |

ONION (Red Wethersfield).

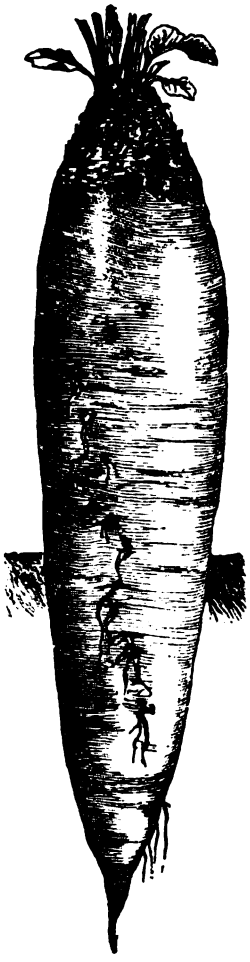


| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 50 | |
| Size—Should be not less than 3½ inches in diameter | 20 | |
| Color—Should be dark red | 20 | |
| Quality—Ripeness, firmness and small neck | 10 | |
| | 100 | |

BEET (Turnip Rooted).



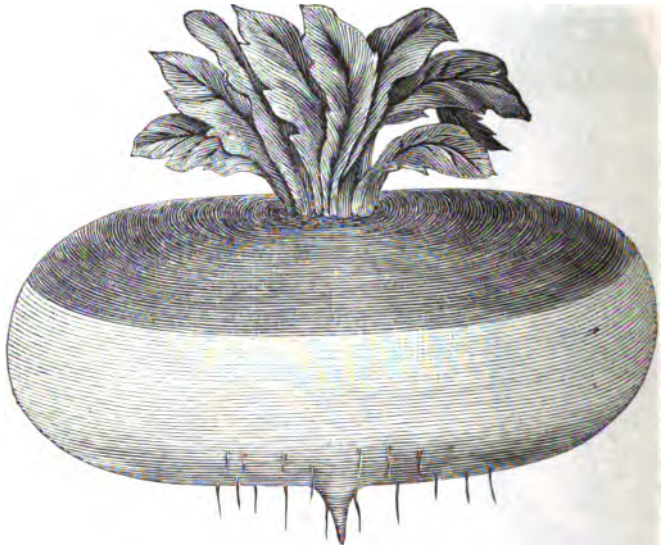
| | No. of Points. | Score. |
|---|---|---|
| Color—Flesh should be of deepest blood red | 40 | |
| Form—Should be according to engraving | 30 | |
| Size—Should be 3 inches to 3½ inches in diameter | 20 | |
| Quality—Fresh appearance, uniform in color throughout | 10 | |
| | 100 | |



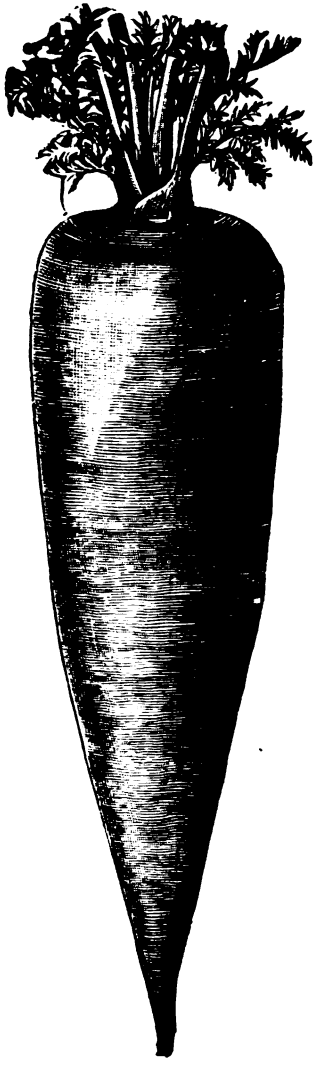
## MANGEL-WURZEL.

| | No. of Points. | Score. |
|---|---|---|
| Size—Should be not less than 14 inches long | 50 | ---- |
| Form—Should be according to engraving | 30 | ---- |
| Color—Should be light red | 10 | ---- |
| Quality—Fresh appearance | 10 | ---- |
| | 100 | ---- |

TURNIP (Flat).



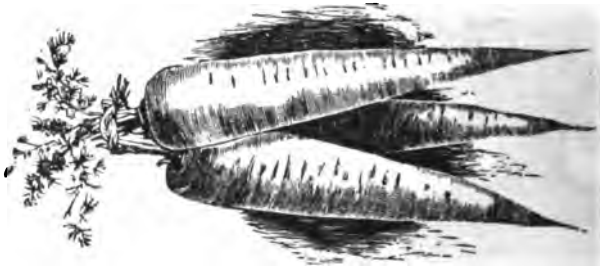
| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 40 | .... |
| Size—Should be not less than 3½ inches and not more than 4½ inches in diameter | 30 | .... |
| Color—If purple top, color of top should be bright purple; if white, color should be cream white | 10 | .... |
| Quality—Fresh appearance and smooth surface, free from woody or faulty spots in fibre | 20 | .... |
| | 100 | |



CARROT (Intermediate).

| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 40 | ---- |
| Color—Deep orange | 20 | |
| Size—Should be not less than 6 inches in length and not less than 2 inches in diameter at the thickest part | 20 | ---- |
| Quality—Fresh appearance and smooth surface | 20 | ---- |
| | 100 | |

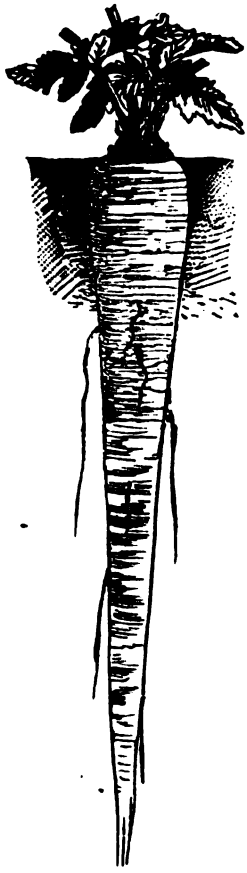
CARROT (Long Orange).



| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 40 | .... |
| Color—Deep orange | 20 | .... |
| Size—Should be not less than 10 inches in length and 2½ inches in diameter at thickest part | 20 | .... |
| Quality—Fresh appearance and smooth surface | 20 | .... |
| | 100 | |

CARROT (Danvers Stump Root.

| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 40 | .... |
| Color—Should be deep orange | 20 | .... |
| Size—Should be not less than 6 inches in length and not less than 2½ inches in diameter at the thickest part | 20 | .... |
| Quality—Freshness and smoothness | 20 | .... |
| | 100 | |



PARSNIP (Long Smooth).

| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 50 | |
| Size—Should be not less than 16 inches in length and 2 inches in diameter at the thickest part | 20 | |
| Color—Light cream, free from rust | 20 | |
| Quality—Fresh appearance, not corky | 10 | |
| | 100 | |

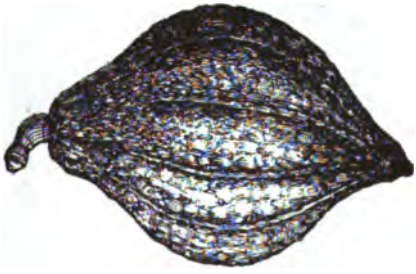
PARSNIP (Hollow Crown).

| | No. of Points. | Score. |
|---|---|---|
| Form—According to engraving | 50 | |
| Size—Should be not less than 12 inches in length and 2¼ inches in diameter at the thickest part | 20 | |
| Color—Should be light cream, free from rust | 10 | |
| Quality—Fresh appearance, not corky | 20 | |
| | 100 | |

## HORSE RADISH.

| | No. of Points. | Score. |
|---|---|---|
| Size—Larger the better | 30 | ---- |
| Form—Should be according to engraving | 40 | ---- |
| Color—White | 20 | . |
| Quality—Fresh appearance | 10 | ---- |
| | 100 | ---- |

## SQUASH (Hubbard).



| | No. of Points. | Score. |
|---|---|---|
| Weight—should be not less than 10 nor more than 20 pounds | 20 | ---- |
| Form—Should be according to engraving | 30 | ---- |
| Color—Should be deep green | 20 | ---- |
| Quality—Hardness of shell | 30 | ---- |
| | 100 | ---- |

SQUASH (Essex Hybrid).

| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 40 | .... |
| Weight—Should be from 15 to 20 pounds | 20 | .... |
| Color—Should be light orange | 20 | .... |
| Quality—Hardness of shell | 20 | .... |
| | 100 | .... |

SQUASH (Bay State).

| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 50 | .... |
| Color—Should be deep green | 20 | .... |
| Weight—Should be from 15 to 20 pounds | 20 | .... |
| Quality—Hardness of shell | 10 | .... |
| | 100 | .... |

## SQUASH (Marrow).

| | No. of Points. | Score. |
|---|---|---|
| Color—Should be orange yellow | 50 | .... |
| Form—Should be according to engraving | 30 | .... |
| Weight—Should be from 10 to 15 pounds | 10 | .... |
| Quality—Thickness of flesh and general appearance | 10 | .... |
| | 100 | .... |

## CABBAGE (Drumhead).

| | No. of Points. | Score. |
|---|---|---|
| Form—Should be acording to engraving | 40 | .... |
| Size—Head should be not less than 12 inches nor more than 15 inches in diameter | 20 | .... |
| Color—Bright green | 20 | .... |
| Quality—Firmness of head | 20 | .... |
| | 100 | |

CABBAGE (Curled Savoy).

| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 50 | .... |
| Size—Should be not less than 7 inches in diameter of head, leaves not considered | 10 | .... |
| Quality—Fresh appearance and degree of curl to leaves | 40 | .... |
| | 100 | |

CAULIFLOWER.

| | No. of Points. | Score. |
|---|---|---|
| Size—The larger the breadth of flower the better | 40 | .... |
| Color—Nearest possible to white | 30 | .... |
| Form—Should be according to engraving | 20 | .... |
| Quality—Closeness of flower and fresh appearance | 10 | .... |
| | 100 | |

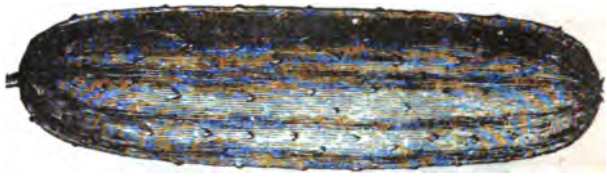
## LETTUCE (Tennis Ball).

| | No. of Points. | Score. |
|---|---|---|
| Size—Should be 10 inches or more in diameter from outer leaf to outer leaf | 60 | .... |
| Form—Should be according to engraving | 10 | .... |
| Quality—Hardness and diameter of head | 30 | .... |
| | 100 | |

## PARSLEY.

| | No. of Points. | Score. |
|---|---|---|
| Curl of Leaf—Should be exceedingly fine curled | 70 | .... |
| Color—Should be very dark green | 20 | .... |
| Quality—Fresh appearance | 10 | .... |
| | 100 | .... |

## CUCUMBER (White Spine).

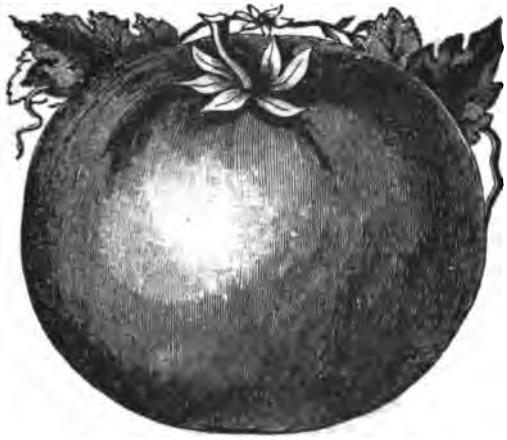


| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 50 | .... |
| Color—Dark green, with whitish streaks at blossom end | 20 | .... |
| Size—Should be not less than 6 inches in length and 2 inches in diameter | 15 | .... |
| Quality—Fresh appearance | 15 | .... |
| | 100 | .... |

## LIMA BEANS (Shelled).

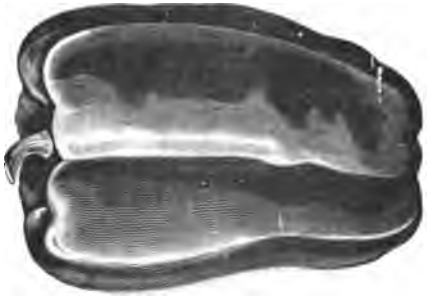
| | No. of Points. | Score. |
|---|---|---|
| Size—Largest scoring highest | 30 | .... |
| Color—Should be greenish white | 30 | .... |
| Form—Should be according to engraving | 30 | .... |
| Quality—Fresh appearance | 10 | .... |
| | 100 | .... |

## TOMATO.



| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 40 | ---- |
| Color—Should be bright red or purplish pink, according to variety | 30 | ---- |
| Size—Should be not less than 2¼ inches and not more than 3¼ inches in diameter | 15 | ---- |
| Quality—Firmness, ripeness and freedom from green spots or cracks | 15 | ---- |
| | 100 | ---- |

## PEPPER (Bull Nose or Sweet Mountain).



| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 40 | ---- |
| Size—Should be not less than 2½ inches in diameter | 20 | ---- |
| Color—Should be deep green | 20 | ---- |
| Quality—Freshness and firmness | 20 | ---- |
| | 100 | ---- |

PEPPER (Squash Variety).

| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 40 | .... |
| Size—Should be not less than 3 inches in diameter | 20 | .... |
| Color—Should be deep green | 20 | .... |
| Quality—Firmness and freshness | 20 | .... |
| | 100 | |

EGG PLANT (New York Improved).

| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 30 | .... |
| Color—Should be deep purple, free from splashes of light | 40 | .... |
| Size—Should be not less than 5 inches in diameter at the thickest part | 20 | .... |
| Quality—Fresh appearance | 10 | .... |
| | 100 | .... |

## CELERY (White Plume).

| | No. of Points. | Score. |
|---|---|---|
| Color—Leaves should be very generally splashed with white, and stalks when bleached should be nearly pure white | 40 | .... |
| Form—Should be according to engraving | 10 | .... |
| Size—The larger the better | 30 | .... |
| Quality—Bleaching and freshness of appearance | 20 | .... |
| | 100 | .... |

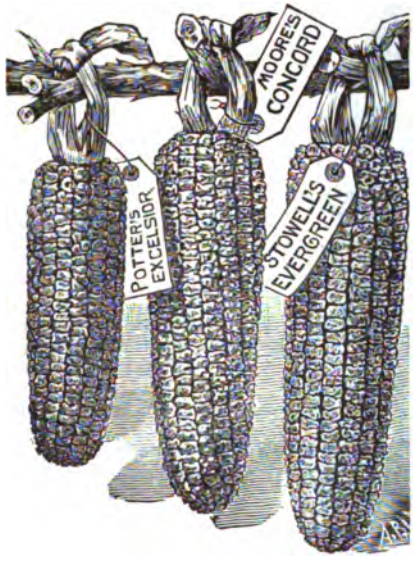
## CELERY (Paris Golden).

| | No. of Points. | Score. |
|---|---|---|
| Color—Should be a golden color | 40 | .... |
| Form—Should be according to engraving | 10 | .... |
| Size—The larger the better | 30 | .... |
| Quality—Bleaching, fresh appearance and nutty flavor | 20 | .... |
| | 100 | |

## CELERY (Boston Market).

| | No. of Points. | Score. |
|---|---|---|
| Color—Stalks should be light straw color | 40 | .... |
| Form—Should be according to engraving | 10 | .... |
| Size—The larger the better | 30 | .... |
| Quality—Bleaching, fresh appearance and nutty flavor | 20 | .... |
| | 100 | |

## SWEET CORN.




| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to engraving | 20 | .... |
| Size—Should be, in case of Potter's excelsior, not less than 8 inches long; Stowell's Evergreen, not less than 10 inches long | 30 | .... |
| Color—Medium dark green | 10 | .... |
| Quality—Sweetness and fresh appearance | 40 | .... |
| | 100 | .... |

## FIELD CORN.

| | No. of Points. | Score. |
|---|---|---|
| Form—Should be according to the particular variety.. | 30 | .... |
| Color—Should be according to variety..... ..... | 20 | .... |
| Size—Should be according to variety..... | 20 | .... |
| Quality—Well cured, small cob, well filled to the tip.. | 30 | .... |
| | 100 | .... |

## FORESTRY.

In reference to the resolution passed by the last Legislature instructing the Board of Agriculture to make a report on Forestry, we hereby make the following report and recommendation :

There are many reasons why our State should exert its influence in the preservation, maintenance and increase of its forests.

Our forests are nature's crop, prepared by long years of patient growth. What has taken ages to produce and will take ages to renew, should be carefully husbanded that future generations may not come to want.

There is no question but that extensive forests greatly add to the evenness of the climate and prevent both tornadoes and drouths. There is also no question but that untillable lands may be profitably kept under timber cultivation, and by judiciously harvesting the mature timber, there may be a constant revenue from the timber lands.

It is the opinion of your Board that the farmers of the State need education in matters pertaining to forestry, as the present method of harvesting is both wasteful to the present crop and injurious to the future.

In regard to legislation, your Board is of the opinion that it would be well if there were laws regulating the cutting of timber so as to affect the climatic conditions of the section and State at large, but the public sentiment would not at present sustain the law, and it would be of no value because it could not be enforced.

Perhaps the first and only way to aid in the preservation of the timber lands is to enact laws to prevent forest fires, for if this could be done, it would aid greatly in preserving the timber and the encouragement to farmers to increase the timber areas. At present there are no laws in regard to forest fires except where intentionally or maliciously set. There are several serious obstacles in the way of effective legislation in relation to forest preservatives or forest fires. No law is of value that is not sustained by public sympathy and has well organized machinery for its enforcement.

The general opinion in this State is that the timber area is on the increase, and that there is no need of combined effort to preserve the timber from the axe. If the public demanded laws in relation to fires, there are some that seem to apply to the needs of the State of Maine, as follows: The Revised Statutes of Maine, chapter 26, provides as follows:

Section 15. Whoever kindles a fire on land not his own, without consent of the owner * * * if such fire spreads and damages the property of others, he forfeits not less than ten, nor more than five hundred dollars; and in either case he shall stand committed until fine and costs are paid, or he shall be imprisoned not more than three years.

Sec. 16. Whoever, with intent to injure another, causes a fire to be kindled on his or another's land, whereby the property of any other person is injured or destroyed, shall be fined not less than twenty nor more than one thousand dollars, or be imprisoned not less than three months nor more than three years.

Sec. 17. Whoever for a lawful purpose kindles a fire on his own land shall do so at a suitable time, and in a careful and prudent manner, and is liable, in an action on the case, to any person injured by his failure to comply with this provision.

The public laws of Maine of 1891, chapter 100, creating a forest commission, provide as follows:

Sec. 6. Camp-fires must be totally extinguished before breaking camp under a penalty of not to exceed one month's imprisonment or one hundred dollars fine, or both, as provided by law.

Sec. 7. All persons engaged in hunting game on any of the wood lands within any town or unincorporated place in the State, shall use non-combustible wads in the loading of firearms used by them.

Secs. 10, 11, 12. Every railroad company whose road passes through waste or forest land, shall each year, and at times when fires are not liable to spread, cut and burn off, or remove from its right of way, all grass, brush or other inflammable material. They shall provide their locomotives with approved and efficient arrangements for preventing the escape of fire and sparks. They shall not permit their employees to deposit fire, live coals or ashes upon their

tract in the vicinity of wood lands, or lands liable to be overrun by fires.

The above laws, or similar ones, with minor changes, might be made to apply to our State when the time comes that the public needs and public opinion demand.

We would suggest the advisability of the Board of Agriculture continuing the instruction by investigations and occasional lectures on the subjects of forest growth and preservation.

UNIVERSITY OF VERMONT AND STATE AGRICULTURAL COLLEGE. DAIRY SCHOOL, JAN. 8—FEB. 10, 1894.

# ABSTRACTS OF LECTURES ON DAIRYING.

*Instructors*—JOSEPH L. HILLS, B. S., Lecture Room.
W. E. SIMPSON, Separator and Churn Room.
WILLIAM STUART, Milk Testing Laboratory.

## PREFACE.

The following pages contain abstracts of forty-seven lectures delivered to the dairy school class of January and February, 1894. Thirty were delivered in Course I by Prof. J. L. Hills, while the seventeen in Course II were given by Dr. F. A. Rich (4), Prof. A. W. Ayer (2) and by Pres. H. E. Alvord, Hons. H. W. Vail, J. O. Sanford, C. M. Winslow, V. I. Spear, H. M. Arms and G. S. Fassett, Prof. L. R. Jones and Messrs. D. D. Howe, William Stuart and G. E. Humphrey. The University is indebted to these gentlemen for their kindness.

It is obvious that in this condensation much had to be sacrificed in matters of sentence construction and fulness of detail and illustration. In most cases but the barest outlines without qualifications have been given. The matter was dictated and the sheets mimeographed during the course of the school, and under conditions which did not permit of their revision. It is hoped that these abstracts will not be too critically scanned. Their shortcomings are thoroughly appreciated, and they were simply meant to be helps and guides to the student rather than a compendium of dairy knowledge.

J. L. H.

## SCHEDULE OF LECTURE COURSES I AND II.

8.30–9.30 A. M., 2–3 P. M.

| I. By Prof. J. L. Hills. | II. By | On |
|---|---|---|
| I. Babcock Test for Fat, | | |
| II. " " " | Vt. Dairymen's Asso. | Meeting. |
| III. " " " | " " " | " |
| IV. Lactometer for Milk Testing, | " " " | " |
| V. Reasons for Testing Milk, | Hon. H. W. Vail, | Jerseys. |
| VI. Payment for Milk by Test, | | |
| VII. Sampling Milk, | | |
| VIII. Obsolete Milk Tests, | | |
| IX. Variations in Milk, | Dr. F. A. Rich, | Milk Fever. |
| X. Secretion of Milk, | | |
| XI. " " | Hon. J. O. Sanford, | Dairying for City Market. |
| XII. " " | Pres. H. E. Alvord, | The Indian Corn Plant. |
| XIII. Physical Properties of Milk, | Hon. C. M. Winslow, | Ayrshires. |
| XIV. Physical Properties of Milk, | Mr. D. D. Howe, | Experiment Station Herd. |
| XV. Chemical Composition of Milk, | Dr. F. A. Rich, | Tuberculosis. |
| XVI. The Fat Globule. | | |
| XVII. Milking. | | |
| XVIII. Creaming. | Prof. A. W. Ayer, | Engine. |
| XIX. Churning. | Hon. V. I. Spear, | Vermont as a Dairy State. |
| XX. Butter Working. | | |
| XXI. By-products of the Dairy. | Dr. F. A. Rich, | Bacteria. |
| XXII. Wastes of the Dairy. | Mr. Wm. Stuart, | World's Fair Dairy Tests. |
| XXIII. Fermentations of Milk. | Hon. H. M. Arms, | World's Fair Butter Exhibit. |
| XXIV. " " | Prof. A. W. Ayer, | Boiler. |
| XXV. Cleanliness of the Dairy. | Prof. L. R. Jones, | Vt. Pastures. |
| XXVI. Dairy Whys. | Mr. G. E. Humphrey, | Repairs. |
| XXVII. Dairying and Fertility. | Dr. F. A. Rich, | Anthrax. |
| XXVIII. Cattle Feeding. | Hon. G. S. Fassett, | Building up a Dairy Herd. |
| XXIX. " " | | |
| XXX. Past, Present and Future of Dairying. | | |

THE THIRD ANNUAL SESSION OF THE VERMONT DAIRY SCHOOL closed Saturday, February 10th, after five weeks of successful work. The entire time was devoted to the study of butter dairying, and to that end a large supply of apparatus was gathered together. There were six power separators in use, the Standard Russian, DeLaval Alpha Turbine and Acme belt, Jumbo, United States No. 1, and Reid's Improved Danish. There were also six dairy size separators in use, the Columbia, United States No. 3 and No. 5, DeLaval Alpha Baby No. 2 and No. 3, and Victoria. Most of these machines were kindly loaned by the manufacturers and were of the latest improved patterns. The horse power used by the belt separators, and by some of the hand machines, was measured by means of the Emerson power scale, a dynamometer manufactured by the Emerson Power Scale Company, of Florence, Mass. The churning room was equipped with three churns, including the New Era Disc churn, with the Fargo, Mason and Waters butter workers, with cream vats, aerators, etc., and while the milk testing room contained two steam Babcock testers, milk and cream test bottles, several kinds of milk and acid pipettes and measures, lactometers and the Mann's acid test for cream.

Two lecture courses were given at the school. The first course consisted of thirty lectures upon the composition and production of milk, conditions affecting its creaming and churning, the best methods of handling at farm and creamery, the methods of testing milk, etc. The second comprised seventeen lectures on miscellaneous dairy topics by prominent dairymen of the State, instructors at the University and others. Experience had shown that dairy school students had not generally received the training requisite for accurate note taking, hence all the lectures were reduced to syllabus form, reproduced by mimeograph process and given to each student. The data taken in separator, churn and testing rooms was daily posted upon the bulletin board, and discussed by the class, and each man kept complete records, including the calculation of losses. These lectures and record sheets, together with the condensed and tabulated work of the school, were bound into a book of about one hundred pages, letter

sheet size, for each student, thus placing in his hands the entire work of the session, neatly and accurately expressed. This book is the subject matter of this portion of the report.

The instruction in separator and churn room was ably given by Mr. W. E. Simpson of Princeton, Indiana, a graduate of the Wisconsin dairy school of 1890, and in the milk testing laboratory by Mr. William Stuart, of Burlington, who was assistant chemist in the World's Fair dairy test.

It was expected to limit the class to forty but nearly eighty applications were received. After refusing a score from outside the State, and after sickness and business calls had prevented several from coming, we still had a class of fifty Vermont students. Nearly half the class had had creamery experience in previous years.

The Vermont Dairymen's Association held a three-day meeting at Burlington during the first week of the school and many hundred dairymen visited the creamery. On January 25 the students visited and inspected the largest creamery in the world, located at St. Albans.

The work in the churn room was particularly successful. Two-thirds of the churnings were made at 52 degrees or below, and the average butter-milks from these low churnings contained 0. 14 per cent. as shown by the steam Babcock tester. In one case the butter came at 47° in 28 minutes; in another at 49° in 15 minutes, and in another at 50° in 36 minutes. The butter sample from the 47 degree churning was lost. The other two were richer in fat than any other butter made at the school. The lowest churning temperature at either of the previous sessions was 53°, and this was obtained in but a single churning. The percentage of fat in the butter-milk noted above is but half that of the average butter-milks of the last session, the churning temperatures of which averged 58°. The butter was of good firmness and texture. The connection between temperature and exhaustive churning is well brought out by this comparison.

The cream was allowed to ripen in the ordinary manner during the first half of the school, but later it was artificially ripened by means of the "Lactic Ferment" supplied through the kindness of Chr. Hansen's laboratory, Little Falls, New York. The ripening

became more regular upon the use of this ferment, and it was the belief of the school that the butter was more uniform and of better quality. The Mann's acid test showed on the average about eight cubic centimeters more of 10th normal alkali consumed when the lactic ferment was used. In no case did the lactic ferment cause over-acidity, as measured by this test.

The next session of the school will be held in January, 1895.

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## LECTURE COURSE I.

BY JOSEPH L. HILLS, B. S.,

Director of Vermont Agricultural Experiment Station. Professor of Agricultural Chemistry, University of Vermont and State Agricultural College.

### I, II, III. BABCOCK TEST FOR FAT.

During the past few years several methods for the accurate, rapid, simple and cheap estimation of fat in milk have been proposed by various American Experiment Stations. The Babcock test, devised by Dr. S. M. Babcock, Chemist of the Wisconsin Experiment Station, and published in Bulletin No. 36, of that Station, is the sole survivor. It is accurate, giving results which agree with the long chemical method and with the churn, when it is understood what true agreement with the churn means. It is simple, requires no skilled chemical knowledge or the handleing of delicate chemical apparatus, and is easily learned by any one of ordinary intelligence. It is cheap, chemical costing but one-fifth of a cent per test, and a four-bottle machine complete costs but six dollars. It is rapid, since with fair manipulative skill and a twenty-bottle machine from twenty to thirty tests may be made per hour. The essentials of the method are: 1. Test bottle; 2. Milk pipette; 3. Acid measure; 4. A centrifugal machine; 5. Commercial sulphuric acid.

1. *Test Bottle.*—This should be of heavy glass and should contain to the neck not less than 40 c. c. Each division of the graduated

scale should contain 0.04 c.c., the entire scale from 0 to 10 equaling 2 c. c. Five of these minor divisions contain one per cent. of fat when 18 grams of milk (which is equivalent to 17. 5 c. c. of milk) is taken, the assumption being that the specific gravity of fat at 120 degrees Fahrenheit is 0. 9. A double sized bottle is often used for skim-milk and butter-milk. The best test bottle in use in cream testing contains a bulb in its neck and may be read to 25 per cent. of fat. For full information regarding this bottle and its use, see Bulletin 5, new series, of the Maine Experiment Station, Orono, Me. With all of these bottles care should be taken that the graduation is correct. There are a large number of incorrect bottles upon the market, and it is best to have the correctness of all Babcock glassware certified by the Experiment Station of the State. If the blackening of the scale is removed in any way it may be restored by using dark chalk, graphite or a little black paint. The bottles are best numbered by roughening the glass with a wet file and using a lead pencil.

2. *Milk Pipette.*—The preferable form has a wide mouth. 17. 6 c. c. will deliver 17. 5 c. c. Beware of the "fool" pipette devised by manufacturers on the plea that the test will then agree with the churn. They are a delusion and a snare. The test can never show as much fat as the churn shows butter if the milk is properly handled.

3. *Acid Measure.*—The original is a glass cylinder graduated at 17. 5 c. c. A little more or less than this may be taken as circumstances warrant. The overflow pipettes, as proposed by the Experiment Stations of Champaign, Illinois, and Ames, Iowa, are useful in creameries, as well as a large glass burette capable of delivering several successive charges of acid.

4. *Centrifugal Machine.*—As a rule the cog-wheel machine is to be preferred, because there is no loss of motion in using cogs. Friction and belt machines are liable to lose motion owing to the wear caused by friction and the slipping of the belt. Better than either are the steam machines as manufactured by the Moseley & Stoddard Manufacturing Company, of Rutland, and the Vermont Farm Machine Company of Bellows Falls. Either of these,

if steam is available, will prove far more satisfactory than any hand machine.

5. *Commercial Sulphuric Acid.*—This should be of 1.82 to 1.83 specific gravity. If weaker than this it fails to dissolve the curd. If stronger, it chars the fat. It should be kept stoppered to prevent it from absorbing water, and should be kept in glass.

*Sampling Milk.*—If fresh from the cow pour backwards and forwards three or four times and dip. If older than this pour backwards and forwards more than this and use such care as insures the thorough mixing of the somewhat tenacious cream into the milk. Avoid violent agitation, and use gentle methods of tipping, finger rubbing and rotation. Sour milk may be brought into condition to sample by the use of a caustic alkali. Samples on which the cream is dried cannot be accurately tested.

*Pipetting.*—Draw the milk to above the line, clap the end of the the fore finger on the pipette, slightly loosen until the milk has dropped to the line, when firmly clasp again and deliver the milk into the bottle, holding the same in a slanting position.

*Adding Acid.*—Tilt the bottle and run in 17. 5 c. c., allowing it to flow down the side. If one has a hand machine, fill all bottles thus before shaking. If the steam machine is used, however, shake the bottles at once. For points upon the manipulation of adding the acid to the milk, see Bulletin No. 27 of the Illinois Experiment Station, Champaign, Ill. Mix with a rotary motion, pointing the bottle away from the face. The shaking should be continued sufficiently long to make absolutely certain that all the curd is dissolved. This is particularly important in testing butter-milk. The action of the acid is: (1) it unites with the water of the milk, (2) it chars the milk sugar, turning the liquid a dark brown, (3) it dissolves the curd, and (4) because of the intense heat it melts the fat. The separation by gravity is never complete, and the bottle must be whirled.

*Whirling*—Balance the machine with an even number of bottles. If necessary add a bottle full of water to balance. The bottles should be whirled the first time at least five minutes, and they may be run as much longer than that as desired without detriment. If hand machines are used the inside wheel should run according

to the diameter of the machine from not less than eight hundred revolutions for the very largest sizes to twelve or fourteen hundred with the smaller machines. The steam machines should be run at a medium speed, but on account of the intense heat do not need to run as high as the hand machines, although no harm is done by high speed if bottles do not break. When stopped, add boiling hot water to the base of the neck, whirl two minutes more, fill again with boiling hot water until the top of the column of fat rests at from 8 to 10 of the scale. Re-whirl one minute. In case a hand machine is used it is sometimes necessary to put boiling hot water into the machine itself to keep the bottles from cooling.

*Measuring the fat*—The conditions of a successful test are a brown acid liquid and a clear column of melted fat, with little or no undissolved casein. Traces of curd, black or white, may be disregarded, but if large quantities are present the test should be repeated. The fat may be measured at any temperature above the congealing point. If solidified it may be read on remelting. Read promptly and read twice independently, taking the mean of the readings. The fat column may be raised by carefully adding a mixture of half acid and half water or may be lowered by placing the body of the bottle in cold water. The reading may be made by the subtraction of the lower from the upper figure, or by the use of dividers. Read from the extreme top to the extreme bottom. If frequent tests of the milk of the same cow, or patron, are made, refer back to previous tests, and if there be marked disagreement repeat and re-read.

To clean the bottles run out the acid with a whirlpool motion, dip the neck into hot water to melt and run out the fat, throw that water away and rinse with boiling hot water two or three times, using also, if necessary, some soap powder.

*Precautions*—Keep the sulphuric acid out of the reach of all except those who use it. Run the slops where they can do no harm to animal life. Have plenty of water at hand. Look out for breaking bottles when taking off the cover, either during or after whirling. Point the bottles away from the face in shaking. If acid gets upon the clothes, use first plenty of water and then use am-

monia freely. If it gets upon the hands, face or eyes, use water freely.

### IV. THE LACTOMETER FOR MILK TESTING.

The analysis of milk centers around the determination of fat, which is commercially the valuable ingredient. There is no call for, nor is there any simple means of determining the other ingredients, save one, for determining the total solids. The term "total solids" means all the solid matter in the milk. This method calls for (1) a correct lactometer, (2) the Babcock or any other test for fat, and (3) a formula. The lactometer is an instrument for taking the specific gravity of milk. The gravity of pure milk is seldom below 1.029 or above 1.034, although the milks of individual cows may sometimes exceed these limits. Cream has a lighter gravity than milk and fat a lighter gravity than water, in the proportion of 0.9 to 1, while the other solids dissolved in the milk increase its gravity; hence, there are two antagonizing influences, affecting the relative weights of milk, the fat lightening and the other solids increasing its gravity. Each per cent. of fat lessens the gravity .001, each per cent. solids not fat increases gravity .004. The effect of adding water is to lessen gravity, for it is adding 1 to 1.032. The effect of skimming is to increase gravity, for it is taking 1 (cream) from 1.032. Assume 9 per cent. solids not fat, 4 per cent fat, in average milk. Nine times .004 less 4 times .001 equals .032, or the average gravity of milk in excess over that of water. If we take away 1 per cent. of fat in skimming off cream, we find 9 times .004, less 3 times .001 equals .033, an increase of .001 in gravity.

Do not use the lactometer in freshly drawn milk, as results are incorrect owing to the milk gas. Milk must be at least twelve hours old before entirely correct lactometer readings can be taken. There are many incorrect lactometers on the market. It is advisable that all such instruments should be tested by the Experiment Station of the State before being used.

The formula (a simplification of the Hehner and Richmond formula) for the determination of total solids is: $T = 1.2\ F + L \div 4$ (T indicating total solids, F fat, and L lactometer reading).

Example:

4 per cent. fat; 32 lactometer. 4x1.2 equals 4.8; 32 divided by 4 equals 8; 4.8 plus 8 equals 12.80, per cent. total solids.

### V. REASONS FOR TESTING MILK.

The creamery and cheese factory should test the milk delivered by its patrons; first, that it may pay them justly; second, that it may check dishonesty; and, third, that it may prevent wastes. The variations of milk are great. The same cow at different times, the same herd at different times, different herds at the same time or at different times, give very different qualities of milk. The reasons for these variations are not always plain, but are often due to the individuality of the herd or of the breed. Whatever their cause, there is no question of the existence of wide variations, nor is there question that the fat in milk is the best measure of its butter or cheese value; hence, payment by test is the correct method to follow. This is true of the cream-gathering factory as well as of the separator. The pooling system places a premium upon dishonesty, which disappears entirely with the introduction of the test. There are chances for large losses in skim milk, butter milk and wheys, which are best detected by the use of the test. The farmer may use it to test his individual cows. There is a vast difference between cows, and by means of the scales and the test one may weed out the unprofitable cows and breed only from the best. In common with the factory proprietor the farmer can use tests to check wastes.

### VI. PAYMENT FOR MILK BY TEST.

Payment for milk by test is just at either the creamery or the cheese-factory. The pooling system is unjust at both places, because it assumes that the butter and cheese value of all milks are the same. It is recommended that the methods described in Bulletin No. 16 of the Vermont Experiment Station be made the basis of test payments at creameries. Method No. 2 there described is based on the payment of certain sums per pound of butter fat, and by means of the table in the bulletin the butter value of a hundred pounds of milk of the various degrees of richness, from 3 to 6 per cent., and at various rates per pound of fat, are given. Care should

be taken that the person figuring the returns should understand the difference between a pound of fat and a pound of butter, and not pay the patrons for the pound of fat alone, regardless of the surplus.

The payment for milk according to its fat percentage at the cheese-factory is just and correct. Pooling is wrong, because (1) milks differ in cheese-producing quality, (2) it is unjust and unbusinesslike, (3) it discourages good milk and good breeding, and encourages adulterations. On the contrary, payment by the test is right, because (1) the amount of fat in milk is an accurate guide to the amount of cheese made from normal milk, (2) it is just and businesslike, (3) it induces improvement in milk production, it induces better breeding, feeding and weeding, and better care of the cow and her products, (4) it removes temptation, (5) the better the milk the better the yield and quality of the cheese.

As for part skimming at cheese factories, (1) if any fat is removed the cheese is inferior to that made from the unskimmed normal milk, (2) the average Vermont milk, though better than the milk of most States, is none too good to make full cream cheese, (3) it is questionable if it pays to make both butter and skim-milk cheese, (4) it is better in cases of changing market to make all butter or all cheese.

For facts to substantiate the justice of payment according to test at cheese-factory, see Fifth Vermont Experiment Station Report, Bulletins of New York Experiment Station, Geneva, New York, and results of the World's Fair Cheese Tests.

## VII. SAMPLING MILK.

Milk begins to cream at the moment it is drawn. If one should take a pail of milk the moment the milking was done, should punch a hole in the bottom of the pail, run out the lower half of the milk and then mix the two halves separately, the upper half would be found to be far richer than the lower half, due (1) to creaming, and (2) to the fact that the strippings are the richest portion thereof. To properly sample such milk it should be poured from one pail to another two or three times. When night's and morning's milks are delivered at a creamery, they should be stirred with a long handled

dipper for from one to five minutes, depending on the quantity. A sample may then be taken with the assurance that it properly represents the entire mass. This sample may be taken by means of the dipper, by means of any instrument such as will take a core through the milk, as for instance the sampler described in bulletin 21 of the Vermont Station, or such as was used at the World's Fair Dairy test. The automatic sampler, however, is considered as accurate and preferable. This consists either of a hole punched in the conductor head through which a proportionate amount of milk flows, which may be caught in any suitable receptacle, or, in a quarter or eighth-inch pipe laid in the conductor spout, and through which a proportionate amount of milk flows, which may be caught in a suitable receptacle, or a pet-cock set in at the base of the can. The milk should be poured through a wire mesh as it enters the weigh can, in order to break up clots of cream. The pet-cock is the best form of automatic sampler. It is obviously true that each horizontal inch of milk must contribute its proportion to a sample thus automatically taken, and if it be imperfectly stirred, all cream in horizontal layers, broken or otherwise, with proportionate skim-milk, whole milk or cream will flow through the hole or tube. This method is not only theoretically correct, but is proven to be practically right and to do away with the large proportion of the errors and annoyances of sampling.

The composite sample, the most desirable form of milk sample to take, is built up from day to day with aliquot portions from each day's delivery. The sample may be kept sweet by the use of poisons, such as corrosive sublimate or bichromate of potash. If the former be used, mix with it about one-fiftieth its bulk of magenta dye, in order that the poisonous milk may be colored. The bichromate of itself colors milk yellow. A small quantity of these chemicals will suffice to keep milk in a sweet condition for a week or ten days. If thought best, the milk may be allowed to sour and be restored to a pipetteable condition by the use of caustic lye. Milks may be directly pipetted from the weigh-can into the Babcock bottle, using a 5 9/10 c. c. and sampling three days in a week, or a 5 c. c. pipette and double sized bottle. Samples churned in transportation cannot be accurately analyzed. There is not the need of such extreme care in the sampling of skim-milk, butter-milk or whey.

## VIII. OBSOLETE MILK TESTS.

The Cream test, or the measuring of bulks or depth of cream, fails as does also the space system, because milks of the same quality throw up different bulks of cream. If milks be whirled as in the Fjord's system the bulk of cream is a closer measure of the fat percentage. Optical tests by the use of the pyroscope and lactoscope fail, because the opaqueness of milk does not depend upon the per cent. of fat, but upon the manner of its distribution. The Lactobutyrometer and Soxhlet's Areometric, as well as the long chemical methods, have only a laboratory interest. The Lactocrite whirls a mixture of milk and glacial acetic acid, in which after boiling the fat is measured. The machine costs about $150, and is adapted only to the DeLaval Separator. The test churn and gang churn churn milk or cream and measure or weigh the resulting butter. They both fail in that both butter and buttermilks are apt to be of uneven richness. Short's Test boils milk with strong alkali, neutralizes the latter with acid, and then measures the resulting fatty acids. Parsons and Failyer and Willard's methods treat milk with soap and gasolene, or hydrochloric acid and gasolene. The gasolene is evaporated and the fat measured or weighed. The Cochran test does essentially the same thing, substituting ether for gasolene. The Patrick method boils milk with acids and after considerable manipulation measures the fat. The Beimling method, largely worked up at the Vermont Station, whirls milk to which has been added a mixture of half and half hydrochloric acid and rectified amyl alcohol and, then, sulphuric acid, the fat being measured after half a minute's whirling.

## IX. VARIATIONS IN MILK.

Variations in milk and its products have been known to exist for many years. The causes for the variations often lie deeper than can be traced, but it is sometimes possible to closely predict what may be expected under certain circumstances. Cows shrink in quantity and increase in quality as they get further from calving. In a farrow cow there is slight quality change. Spring calving cows give more milk in the first three months than do fall

calving cows, but less than the latter in the seventh, eighth and ninth months of the year. Cow's milk is usually thinnest just after calving, and is very variable in character for the first two weeks. Cows vary in quality of milk from day to day without apparent cause, some remaining very constant and others inconstant. Just after calving the milk is poorest in fat and solids not fat, and usually richest just before going dry. The quality of milk given by a cow during her first period of lactation is not usually materially bettered in after life. It seldom, if ever, grows poorer. They may be expected to vary this not more than one-sixth of a per cent. The milk of a heifer tends to be like that of her dam. The milk given at four months from calving is closer to the average of the year than that of any other time. Cows properly fed at the barn do not shrink in quantity of milk when changed to pasture, but usually increase in both quantity and quality. Average Vermont milk contains 4 11-100 per cent. of fat, equivalent to a pound of butter from 22 pounds of milk. Cows on pasture give richer milk as the temperature falls and poorer milk as the temperature rises, or, in other words, the fat in milk varies inversely as the temperature changes.

### X, XI, XII. SECRETION OF MILK.

Inasmuch as the milk comes from the food it is necessary to have a thorough understanding of digestion. The secretion of milk is common to all families of the mammalian type, and is their distinguishing trait. The food enters the mouth, passes down the gullet, and in the case of the cow into the first stomach or rumen. The cow has four stomachs, (1) rumen, (2) abomasum, (3) omasum, (4) rennet. The rumen is simply a great storehouse for food, it is nine times the size of the other three stomachs, and, with the second, holds the cud before chewing. The cud on being chewed and mixed with saliva passes into the third stomach, which has many folds of mucous membrane and acts as a grinder, and then enters the fourth stomach for true stomachic digestion. The organs of digestion in the mouth are the teeth, tongue, salivary glands and organs of taste. There are five salivary glands in various parts of the mouth, pouring about one gallon of saliva per hour into the

mouth. The active principle of saliva is a ferment called ptyalin, which has the property of changing starch into sugar. In the human stomach digestion may be largely done outside the body by the the use of artificial ferments. This, obviously, cannot be done with the cow. The gastric juice of the rennet, or true stomach, contains pepsin, a ferment which changes proteids (flesh-formers) into peptones, which are soluble, also a curdling ferment containing hydrochloric acid. Some peptones and sugars are absorbed by the vessels of the stomach, but most of them pass on to the intestine as chyle. The intestine has a worm-like motion, called the peristaltic motion, which serves to propel its contents forward. There are seven different intestinal ferments at work, delivered by the pancreas, liver, gall-bladder and intestinal follicles. These change proteids into peptones, starch into sugar, emulsify fat, etc. The effect of these ferments and solvents is to transform raw material into true food, which is absorbed by the villæ of the intestines and conveyed into the circulation, partly by the lymphatics and partly by way of the liver. The emulsified food enters the villæ (which line the inside of the intestine like velvet), passes into minute tubes which run into the lymphatic system, emptying into the blood at the left hand side of the base of the neck. Peptones and sugars pass through the villæ into the blood capillaries, thence to the liver (where some unknown change takes place), thence through the hepatic veins into the circulation.

The object of blood circulation is the renewal of worn-out bodily tissue. Arterial blood yields up its oxygen to burn up the carbonaceous matter, deposits of its material to build up new tissue, and, loaded with carbonic acid and other poisonous matter, becomes venous blood, and passes through the kidneys, which take out the nitrogenous and other portions of waste, thence to the heart and lungs to be re-oxygenated and to do its work again.

The blood flows to and builds up the mammary glands. Its structure and all it contains comes from the blood. The cow's udder consists primarily of two longitudinal glands, the line of division being a fibrous partition, which is also a supporting ligament, running parallel to the spine. There are other ligaments supporting the udder which run out on the abdomen and thighs.

The usual division of the udder into four quarters is not anatomically correct, although there are four separate milk cisterns. Underlying the skin is a strong layer of connective tissue of elastic, fibrous material, which serves to support the gland. It is the elasticity, yet firmness of this tissue which enables the organ to withstand the violent changes in size. The entire udder may be likened to a sling which the various parts are held. When divested of its covering it appears as a grayish white substance, shot with red, overlaid with fat. Each gland is composed of several separate glandules. The true glands are the four mammary glands within the sling of connective tissue and skin.

The teats consist of two parts, basis and nipple. Just above the basis is a small reservoir called the sinus or milk cistern, the opening from which into the channel of the teat is surrounded by a sphincter muscle which holds the milk back. Many fine ducts lead from the sinuses into the structure of the glands, collect the milk formed there and take it to the cisterns. These branch in every direction, growing smaller and smaller, surrounding and penetrating every portion of the gland, but each proceeding to a distinct lobule in each grandule. These lactiferous ducts are slightly contracted at each end, bulged in the middle, thus forming myriads of little sacs augmenting the milk-holding capacity and equalizing the pressure throughout the udder. In no other way could a cow give such enormous quantities at one time, since the four sinuses hold but little milk. If one should milk a cow in full flush they might get from 20 to 25 pounds at one milking, yet if the same cow were to be killed instead of being milked there would be but few pounds of milk found in the bag. It is plain then, that much milk is elaborated during the process of milking. An excess of fat around the gland is not a part of the gland ; it is unavailable for milk-making, exerts undue pressure on the glands, clogs the system by its pressure and tends to lessen the milk flow. Such udders look large and promising, but have not the characteristic "soft feel" and are known as flesh udders. The arteries and veins of the udder must be large in order to do its work, for the call of the udder upon the circulation is loud and imperative. The arteries enter it from the rear, pass along the upper part, branch-

ing six times into its structure. Veins, lymphatics and nerves also ramify throughout. The milk vein which flows from the udder is considered a good indication of the animal's qualities at the milk pail. This belief is a correct one, since the greater the yield the greater the call on the circulatory system and the better developed its arteries and veins must be. The mammary glands begins to develop before birth, but is not sufficiently formed to do good service until the heifer is at least 18 months old. The physiology of the formation of milk is not fully understood. There are two principal theories of its formation, each having strong and weak points. One is called the theory of transudation, the other that of metamorphosis. The first assumes a simple filtering of the constituents of the milk from the blood through the gland, thus making it milk. The second assumes that it is formed in the gland by the breaking down of the cellular structure, which is equivalent to saying that milk is simply decomposed udders. This latter thought is at first somewhat nauseating, but when we consider that decomposition has just started and that with proper care it can be kept from passing further it becomes less distasteful.

Let us sift out the claims of these two theories. According to the theory of gland decomposition, (1) food does not materially affect the quality of milk, (2) colostrum particles are certainly broken down cellular tissue, (3) blood serum ash is rich in soda and poor in potash. Animal tissue ash is rich in potash, poor in soda. Milk ash is rich in potash, poor in soda, and resembles the tissue ash rather than the serum ash. Moreover, if milk is filtered blood, the blood flowing from the udder during milking time would have less potash than that entering the udder, whereas it does not. (4) Casein contains nuclei. Such bodies cannot come from blood. (5) Blood is often changed in character, and if milk came directly from it, it would more often show poisonous qualities.

On the other hand, we may say for the blood transudation theory, (1) food does affect milk, as for instance in the effect of onions, (2) some fatty foods appear to feed fat into the milk, (3) drugs pass from mother to offspring from the milk very soon after taking, and blood poisons in the mother poison the nursing off-

spring, (4) there are materials in blood precisely akin to those in milk, (5) the lymphatics which are in close connection with the gland glandules are full of white blood corpuscles during milking, and are in a state of high activity.

It is impossible to assign to either theory the part it plays, but it seems most probable with our present light that the water does transude from the blood but that the solids are more likely to come directly from the glandular structure. Certainly, reasoning by analogy, with a storehouse of prepared food at hand in the shape of the cellular structure of the udder, it were strange if the milk went back to the raw material of the blood.

### XIII, XIV. PHYSICAL PROPERTIES OF MILK.

Milk is a whitish, opaque fluid, slightly heavier than water, generally neutral, but sometimes acid and sometimes alkaline in reaction, which boils a little above the boiling point of water and freezes a little below its freezing point. Unlike water, but like all other fluids it contracts to the freezing point and then expands.

1. *Opacity*—This is that quality of a body which renders it impervious to the rays of light. Glass and crystal quench some rays, and the most opaque mineral if cut in thin enough sections permits some rays to pass; hence opacity is largely conditional upon the thickness of the material under examination. Theoretically, milk is not opaque, although practically it is. This may be determined by placing milk under a microscope where we see it to be a transparent fluid in which float opaque, fat globules. The whey of milk, which is considerably more than 90 per cent. of its bulk, is transparent. This phenomenon of milk is due to the myriads of free fat globules which float in the milk, which by their opacity, numbers and effect on the rays of light cause the apparent opacity of milk. The smallest sized globules make up about a fifth of the total number, yet contain but one two-hundredth of the total fat. Apparently casein has also something to do with rendering milk opaque.

2. *Color*—The white color of milk is due to the effect of the fat globules upon the light. The theory generally held is that color is simply the power of substances to reflect or absorb various

portions of the spectrum. The white sunlight is resolved by a prism into red, orange, yellow, green, blue, indigo and violet colors. If we paint these colors on seven successive segments of a wheel and whirl that wheel at a high enough speed it will appear white; hence the division of white makes the various colors and the merging of the various colors makes white. Black is the absence of all color, or the absorption into the body of the material of all colors, while white is the reflection of the body of the material of all colors. If a body shows any color except white or black in a white light, it has absorbed, extinguished and refused to reflect all the colors except the one which is in evidence. The whiteness of milk therefore is dependent upon the fact that the fat globules do not absorb any of the colors, but reflect them all.

3. *Weight*—Milk is slightly heavier than water, in the proportion of about 100 to 103.5. Weight may be defined to be the effect of gravitation, and it is proportionate to the attracting mass, the earth, and the attracted body, the material weighed. The weight of a body compared to the standard (gas standard being hydrogen, solid and liquid standard being distilled water at 4° C. or 39° F.) is called its specific gravity. The specific gravity of some bodies is lighter than that of water, some heavier; the former float, the latter sink. If a body does not displace a weight of water equal to its own weight, the remainder of the water undisplaced buoys it up and it floats. If it does thus displace, there is no water left to buoy it up and it sinks. Materials containing air or gas act as if the air or gas, as the case may be, were a part of the body. The quickest and easiest method of determining the specific gravity of a liquid is by use of the hydrometer. There are special kinds of hydrometers, that used in milk analysis being called a lactometer. For description of this instrument, see lecture No. IV.

4. *Viscidity*—Milk is more viscid than water, that is to say, more mucilaginous. Butter-milk is the most viscid of milk products, except colostrum. Increased percentages of solids, lengthening time of lactation and decreasing temperatures all tend to increase the viscidity of milk, and tend to cause poorer creaming.

5. *Reaction*—Milk is usually neutral in reaction; is sometimes amphigenic, that is to say, reacting both acid and alkaline at the same time. The reason for these changes are not entirely clear, and as a rule have no material effect upon the ordinary uses of milk.

## XV. CHEMICAL COMPOSITION OF MILK.

Milk is a thin emulsion of butter fat in a watery solution of albuminous and caseous matter, milk sugar and ash. It contains besides these things minute quantities of citric acid, lacto-fibrin and several other ingredients. The milks of different mammals contain the same ingredients, but in widely different proportions. Milk contains all that is necessary to sustain life, as may be seen by the diet of the infant, which both lives and grows on milk alone. Adults have lived several years on milk diet. The ingredients of milk are:

1. *Water*—Water is composed of two parts hydrogen and one part oxygen in bulk. By weight, however, owing to the fact that oxygen is sixteen times as heavy as hydrogen, it is one part hydrogen to eight of oxygen. Water may be resolved into its elements, or the elements may be combined again as water. Whether the water comes from the cow or from the pump it has chemically the same composition.

2. *Fat*—See Lecture XVI.

3. *Casein*—Casein exists in a thin jelly-like swolen condition, dissolved and yet not dissolved. If the milk be poured upon a porcelain plate the fat and casein fail to pass through it because they are not in solution. Casein may be coagulated (1) by souring, caused by the formation of lactic acid through germ action, forming a spongy massive precipitate, (2) by rennet, which forms a jelly-like precipitate, (3) by mineral acids, forming a flake-like precipitate, (4) by mechanical processes. Rising temperature favors curdling. Rennet action takes place only under certain circumstances and at certain temperatures, and is not well understood. Casein exists combined with phosphate of lime, and is not precipitated by acids until the phosphate becomes acidified.

4. *Albumen*—The white of an egg is pure albumen. There is normally about 0.6 per cent. albumen in milk, which increases largely in colostrum or diseased milk. It passes off in the whey. It is possible to incorporate it into cheese, but it injures its quality.

5. *Milk Sugar*—This is an ingredient peculiar to milk, which is found in milk alone. When separated it consists of colorless, transparent prisms, not easily soluble in water, with a slightly sweet taste and gritty to the touch. When milk sours one part of sugar splits up into four parts of lactic acid.

6. *Ash*—The ash of milk consists of those mineral substances needed for animal growth and which exist in the food eaten by cows. Ash consists of about one-fourth each of potash, phosphoric acid and lime, the remainder being soda, magnesia, sulphuric acid, chlorin, etc. The composition of the ash has considerable effect upon the creaming of milk.

## XVI. THE FAT GLOBULE.

Fat is from the commercial standpoint the most valuable constituent of milk, since the market prices of butter and cheese are dependent upon it. Butter fat is about three-fourths carbon, one-eighth hydrogen and one-eighth oxygen. There are nine fats found in butter—butin, stearin, palmatin, myristin, olein, caprylyn, caprinin, capronin and butyrin. A fat is a combination of a fatty acid with glycerin, and the various fats derive their names from the fatty acid; thus, oleate of glycerin is olein. All fats chemically are as tri-glycerides.

Some of the fats of butter are fluid and some solid at ordinary temperatures. Stearin and palmatin are the two solid fats, which melt at about 134 degrees F., and compose about two-thirds of the butter. The rest of the fats are liquid of ordinary temperatures, hence, the mixture of these fats as butter melts at a considerable lower temperature than do either stearin and palmatin alone. The bulk of the butter is made up of palmatin, stearin and olein, the remaining six fats being in small quantities. They are, however, characteristic of butter, and their presence or rather their absence may be made of use in determining whether a sample is genuine

or not. They are also a source of much of the rancidity of butter, and likewise help to give it flavor.

The fat exists in the milk in the form of minute globules, only visible by means of the microscope. They are of all sizes, varying from $\frac{1}{1000}$ to $\frac{1}{4000}$ of an inch, and the numbers found in a quart are up among the millions. The larger globules cream more readily than the smaller ones, as is shown in lecture XVIII. The specific gravity of butter fat ranges from 0.88 to 0.93, according to temperature, and to this light specific gravity is due the phenomenon of creaming. The melting point of butter fat is from 96 to 104 degrees, it solidifies at 74 and is apt to be crumbly below 59. The melting point of butter is decidedly affected by the food of the animal. So long as fat globules are in the milk they exhibit a peculiar behavior, remaining liquid at a temperature when the butter would be solid. For instance, in milk at 40 degrees the globules are still fluid, while if they are united in butter they are solid at many degrees higher. This is known as the condition of under-cooling. As a result of the surface tension peculiar to fluid drops the fat globules are held in milk in a fluid condition, and they become solid by blows and agitation. The former theory of a casein coating or envelope to the fat globule, which broke or was ruptured by blows, permitting the globules to rise together, has been proved to be false. Microscopists claimed they saw it, physiologists and chemists claimed that the action of ether and alkali proved it; but alkali and benzine and chloroform, which are equally good solvents for fat, did not act as did the alkali and ether. It has been definitely proved that the globule does not have a coating of casein.

## XVII. MILKING.

Year in and year out a cow tends to give essentially the same quality of milk, if equally well fed and cared for. There are, however, many influences affecting the quality of a milk from day to day. Among them may be stated :

1. *Complete Milking*—If the milk is not entirely drawn from the udder the losses are (1) loss of milk, (2) loss of strippings,

which are the richest part of the milk, (3) a tendency to cut down the milking capacity of the cow.

2. *Use of Milking Tubes or Catheters*—These are usually injurous because (1) they lessen the milk production, inasmuch as they do not get much more than what exists in the reservoirs or sacs; in other words, they do not stimulate the glands into action, as does the hand manipulation; (2) they inflame the teat; (3) they relax the sphincter muscle, causing leakage; (4) the milk obtained does not contain the strippings, (5) the loss may be as great as eight pounds of milk or one-third of a pound of butter per cow per day. They have their use in hard milkers, but milking by machinery, although advocated, has not yet become practicable.

3. *Milking One Teat at a Time*—If this be done they give milk in the following order of richness: Second, richest milk; first, the next; fourth, next; third, the poorest. This is true, no matter what the order of milking is.

4. *Changing Milkers, Quarters, Etc.*—(1) A rapid milker gets more milk than a slow milker, (2) changing from one milker to another lessens quantity and quality, (3) change of quarters has the same effect unless the change be much for the better, (4) fatigue, excitement and worry differently affects different cows. Some give more and poorer, some more and richer, some less and poorer and some less and richer.

5. *Milk Perservatives*—(1) Ice preserves milk, because cold does not favor bacterial action, (2) sterilizing milk preserves it because it kills bacteria. Pasteurizing (heating to 150 degrees F., and rapidly cooling) preserves milk because it retards bacterial growth. (3) Chemicals, such as salicylic and boracic acids, preservaline, etc., keep milk because they are bacterial poisons and kill the germs. They are also poisonous to the human if taken in sufficient quantities.

## XVIII. CREAMING.

The phenomenon of creaming depends upon the difference between the specific gravity of the fat globule and that of the milk serum. Their gravities are respectively 0.9 and 1.036. Influences increasing this relative difference aid creaming, those decreasing it

hinder creaming. In deep setting the serum is made relatively and specifically heavier by lowering the temperature. Milk serum is a better conductor of cold, cools quicker than the fat globules, therefore shrinks more rapidly, thus increasing the difference in specific gravity. Yet warm milk is the proper thing for the separator for it handles milk at stationary temperature and the higher temperature is more favorable to centrifugal separation, inasmuch as the globules are more fluid. Large globules cream better than small, and skim-milk fat is mainly composed of very small globules. One of the ingredients of milk is fibrin, which forms networks of fibres through the milk, causing clotting of the fat globules, and poorer creaming. The large globules are able to break through these clots, but they prevent the smaller ones from rising. The formation of fibrin is aided by rough surfaces, agitation, exposure to air and slow cooling, and is retarded by high heat, by cold and by certain chemicals. In the centrifugal separator it passes largely into the slime.

There are three principal methods of cream setting, viz.: shallow setting, deep setting and centrifugal.

1. *Shallow Setting*—By this process milk is set in small pans, crocks, etc., cools gradually, the fat globules rising from 2½ to 3 inches, the cream being removed after the milk becomes sour. This is not a successful system, inasmuch as it exposes the cream to undesirable influences, because it favors fibrin formation and because there is no increase in the relative differences between the gravity of the fat globule and the serum. It is safe to say that the average shallow setting wastes one-fifth of the fat in the milk.

2. *Deep Setting*—There are many systems of deep setting, differing in minor details. It consists essentially of placing the milk, immediately after being drawn from the cow, in a deep, generally cylindrical, can, which is then immersed or submerged in ice water, there to set from twelve to forty-eight hours. The cream rises and is skimmed off in a sweet, fluid condition by various devices. Depth of milk and a thermometric fall of 50 degrees, say from 90° to 40°, are the essentials of this system. Depth is desirable for economy of space and time, but unless cooling is rapid the

deep can is less desirable than the shallow one. Creaming seems slow, since a globule in an 18 inch can, creaming in 12 hours, rises but 1½ inch per hour; but, owing to their minuteness, this seemingly slow rate is relatively rapid, since it requires the smallest globules to move each second over a space many times their diameter.

Up to the introduction of the Babcock test, it had been the custom to buy cream raised by these deep setting systems, according to bulk, the so-called "space system." It has been thoroughly proved, however, that creams raised from different herds under different conditions may vary greatly, some being nearly twice as rich as others. Cold is absolutely essential for successful work. When the temperature of the water is not lower than 50 degrees F. the loss is excessive, reaching in some cases to a quarter of the entire fat. The cream raised in cold setting is more voluminous and poorer in fat than that raised in moderately warm water. A 24-hour setting gives richer cream than a 12-hour setting; hence the dairyman who does not use ice in the creamer cheats himself, helps his neighbor and helps the creamery, since the spaces are less and richer. Delays in setting milk sometimes cause losses in the skim-milk and sometimes do not. It is better, however, on general principles to place the milk in the can as soon as possible. In case of lack of ice more efficient creaming is sometimes, but not always, obtained by diluting the milk with hot water. This renders it less viscid and enables it to receive the same thermometric fall of 50 degrees, although in a somewhat higher range on the thermometer, as for instance from 105° to 55°. Dilution is but a makeshift. It calls for more tank room, lessens the value of the skim-milk, and throws up a denser cream, which sours more rapidly, necessitating churning every day. Usually twelve hours is sufficient to raise all the fat which will be raised by gravity in deep setting. Herds differ, however, on this point. In skimming care should be taken not to lose cream by currents in the skim-milk, if skimming from the bottom. It is safe to leave two spaces of skim-milk. The faucet should not be repeatedly opened and shut, as this tends to create currents.

3. *Centrifugal Separation*—When a particle of matter is

swung around a central point, the force with which it presses outward from the center depends on (1) its weight, (2) its speed, (3) the distance from the center. One pound revolving on a radius of one foot, at one hundred revolutions per minute, exerts a force of 3.4 pounds. This force increases in geometrical ratio so that at two hundred revolutions per minute it pulls at 13.6 pounds, at four hundred 54.4, at one thousand 340, at five thousand 8500. The formula for the calculation is centrifugal force (F) equals 3.4 times the radius times the weight times the square of the speed. In other words, for one thousand revolutions per minute on a one-foot periphery, the centrifugal force is 340 times the weight of the matter which is being acted upon. This will serve to show the reason for the increased power of centrifugal force.

The centrifugal separator is an improvement over the other systems in many ways. (1). There is more complete separation of the fat. (2). There is less need of ice. (3). Several of the conditions in connection with handling milk are better controlled. Accurate experiment has shown that the loss in a good separator, properly handled, is about one-third of that in average deep setting, and with a herd averaging one hundred pounds of milk per day the separator may be expected to save 280 or more pounds of butter in a year, which would not be recovered by other systems. On the other hand, if fair wages be allowed for the hand labor of turning it, the profit may be much reduced, if not wiped out. It is entirely feasible, however, to use horse or steam power, upon a hand separator. A good separator skim-milk should not test more than 0.10 per cent. of fat; deep setting, from 0.15 to 1.00 per cent.; shallow setting, from 0.40 to 2.00 per cent.

In the choice of separators one should be governed largely by the following points: (1 and greatest), Completeness of skimming. There are separators on the market that habitually skim to 0.10 per cent. or less. No maker or user should be satisfied with poorer work than this. (2). Capacity. It is better to have an over-capacity than an under-capacity. It is better for a creamery to have two machines to do the same amount of work than one, since in case of accident the two are seldom both rendered useless. (3). Cost in proportion to capacity and quality of skimming. (4). Running and

repair expenses, including horse power consumed. These differ considerably with different makes of machines. (5). Completeness of skimming on long runs, that is to say, the power of the machine to skim the last thousand pounds as completely as the first. (6). Simplicity; ease of running by comparatively inexperienced man, small use of oil, fuel, etc.; small number of parts, rendering cleaning easier, etc. (7). Belt or steam machine. The latter are more costly, and are generally thought to be a little more liable to get out of order, but obviate the necessity for an engine. (8). The character of the cream, quality variable at will, delivered smooth, etc. It is probable that the separator has no effect whatever upon the churning of the cream it separates, provided the thickness of the cream be the same. On general principles, the thicker the cream within certain limits, the better the churning.

The quality of the product of these various systems, as judged by market sales, is the same, if each are properly handled. Special markets prefer special goods, but the general market pays the same price for average separator and deep-setting butter. Possibly the grain of separator butter is a little more liable to be injured because of its passage through the machine than is the grain of butter made from deep-setting cream.

## XIX. CHURNING.

Churning milk, either sweet or sour, is not advisable, because (1) it would need too large churns, and too many churnings; (2) if ripened, the buttermilk would be less valuable than the skim-milk; (3) it needs higher temperature, more mechanical power and longer time; (4, and most important,) it makes less butter of a poorer quality.

There are four kinds of cream: 1. Raw sweet cream. 2. Ripened sweet cream. 3. Raw acid cream. 4. Ripened acid cream. The first is the cream as delivered from the separator or the deep-setting, sweet and unacted upon by bacteria. The second is cream still sweet but acted upon by the ripening bacteria as distinguished from the acid bacteria. The third is cream which has been acidified by the lactic acid bacteria but has not been acted upon by the aromatic bacteria. The fourth is cream which has been subjected to

both acid and aromatic bacteria and is the common sour cream of our creameries. The first makes a rather flat butter, the second a very fine tasting butter, and is what is usually used in making ice cream. The third may be made by using a lactic bacteria starter and keeping enclosed in a vat. If left alone, milk and cream become spontaneously acid by the breaking up of the milk sugar. If the process goes on too far, however, the lactic acid fermentation passes into the butyric acid fermentation and the cream becomes putrid. Stripper and tainted milks do not ripen well, or give butter lacking in flavor or off flavor. Many creameries and dairies use what is known as a "starter". Some put sour cream or sour buttermilk into the sweet cream in order to start the fermentation. It is better, however, to use new stock so as not to perpetuate bad flavors. A good method of preparing a starter is to take the newly skimmed milk from a fresh cow, heat it to 85 or 90°, set in a closed vessel until well loppered (generally 24 hours) and add from two to five per cent. of the bulk of the cream of the starter. In using a starter one simply plants a culture of various bacteria to be propagated and spread in the whole mass. There are various methods of using this starter, and there are some commercial starters upon the market.

Makers differ as regards the systems of changing the temperatures of the cream after separation, and rules cannot be laid down absolutely that will fit all conditions. The butter maker must use his own judgment as to the amount of starter used, kind of starter, degrees and hours of ripening, etc. A large percentage of the faults in the quality of the butter may be traced to the cream vat. The Mann's acid test or the lime water test are an aid in the ripening of cream. 50 c. c. of cream if properly acidified with the lactic acid takes from 38 to 42 c. c. of tenth normal alkali for neutralization. Upon this fact the Mann's test is based. An alcoholic solution of phenolphthalein is used as an indicator. This test has been recently improved by Farrington by the use of alkaline tablets of definite strength. Acidity is not all there is to ripening, but it is much. It should be clean and pleasant, not acrid, bitter or disagreeable, and the cream should have a smooth, even, syrup-like, glossy look. The proprietors of Green Mountain Stock Farm at West Randolph expose their cream to the air very thoroughly, and,

as is well known, their butter won the first prize at Paris and Chicago. Sweet cream butter is preferred by many, and is slowly winning its way. The tendency now is toward a butter from but slightly acidified cream. The mixing of creams of uneven ripeness tends to imperfect churning. In cases of small batches of cream it is better to keep them all sweet until a day before churning and ripen together.

*What is Churning?* We do not know for a surety. The old theory that a casein envelope was burst by concussion and by the action of acid is exploded. Soxhlet claims that the fat globule is in an undercooled condition, which is overcome by agitation, rendering the undercooled liquid drops solid. Storch says that the formation of butter commences by the glueing together of microscopic globules in cream, which again become glued until the granules are formed, this being favored by the action of a peculiar watery albuminate called hydrate of casein.

The temperature at which cream churns varies under different conditions and different kinds of cream between 45 and 85 degrees. Below 40 the globules do not cohere any more than shot would. Above 85 they are so liquid as to be subdivided by agitation. Among the conditions affecting temperatures may be mentioned :

1. Sweet or sour cream. The former needs for exhaustive churning a temperature of 54 degrees or below. Both are more exhaustively churned, as a rule, at these low temperatures.

2. Care of cream as regards method of raising.

3. Composition of the butter fat. (1) Different breeds give fat of somewhat different composition. Jersey cream makes a more solid butter and needs a higher temperature. (2) The fat in stripper milk resembles more nearly Jersey fat, and such creams need higher temperatures of churning. (3) Certain feeds, such as cottonseed meal, have the effect of relatively increasing the stearin, and consequently the cream needs to be churned at higher temperatures.

4. Thickness of cream. A 25 or 30 per cent. cream will churn exhaustively, and usually in reasonable time, at 50°, while thin cream, 20 per cent. or below, will not do this.

5. Construction and speed of churns. A concussion churn churns more perfectly than any paddle or dash churn. The speed hould be no more than will allow of complete fall.

6. Quantity of cream. Small quantities churn more quickly than larger.

7. Room temperature. In a warm room a cream, though started at low temperature, warms. Friction warms it more or less.

In general, it may be stated that the lower the temperature of churning the better quality of butter; that cold wash water does not necessarily injure the quality of the butter, but often helps it; that low temperatures generally mean longer churnings, although not always so; that it is a question for each to settle for himself whether the increased butter from lower temperatures will pay the increased labor of obtaining it. The accuracy of the dairy thermometer is an important point. There are on record at the patent office at Washington the patents of over two thousand churns. Pliny described the dash churn two thousand years ago. In general, the dash and paddle churns cause uneven churning and waste of fat. The best churn has no inside fixtures, but churns entirely by concussion. The box, barrel and swing churns are all good. The points to be considered in choosing a churn are (1) ease of keeping clean. The less corners, fixtures, etc., the better. (2) Exhaustiveness in churning. (3) Power used for a given quantity of cream. (4) Solidity of construction. (5) Simplicity of handling. (6) Construction, such as to thoroughly bring a perfect butter.

The Butter Extractor, DeLaval Continuous Churn and Butter Accumulator make raw sweet cream butter, for which at present there is but slight market. Inability to churn is generally due to some one or more of the following causes: (1) Wrong temperature, which may have been determined by an incorrect thermometer, and which may be remedied by experiment, adding warm or cold water, or, better, warm or cold brine. (2) Too full a churn, or too great speed. (3) The use of milk containing colostrum, the use of stripper milk, or milk from sick cows. (4) The growth of certain kinds of bacteria. (5) The peculiar condition of some of the nitrogeneous portions of the milk, probably the albumen, which renders it more viscid, causing the cream to foam and bubble, and hence protect the fat globule from the concussion.

## XX. BUTTER WORKING.

The butter having come, the granules may be made larger by careful manipulation, as regards speed, by the use of brine, etc. Granules are best brought to about the size of wheat. Butter is washed in the granular form to remove the butter-milk, but it also removes more or less flavor, since that is largely soluble. It is questionable if we do not go too far in butter washing. Recent experiments have indicated that the best flavored butter may be that which is entirely unwashed, while experiments at this school, as well as elsewhere, seem to indicate that a very cold water does not necessarily injure the butter.

Color. There are many good colors upon the market. A good color should have no sediment, should be uniform, its butter should not fade, and it should not color the butter-milk nor turn rancid.

Salt. A dairy salt should be nearly pure. The common impurities are sulphate of lime, or common gypsum, which causes it to cake, chloride of magnesium, giving a bitter taste, and chloride of calcium, which causes it to readily become moist. There are many salts in the market containing 97.5 per cent. or more of sodium chloride. A good dairy salt should be entirely free from odor and specks, should have a bluish white color, pure saline taste, without bitter after taste. It should dissolve readily in water, without residue, contain at least 97.5 per cent. of pure sodium chloride, and not more than 0.15 per cent. calcium and magnesium chlorides, 1.5 per cent of sulphate of lime, 0.75 per cent. water, and a trace of insoluble matter. If properly made and dried it should have no damp feeling, except when exposed to wet atmosphere. Table, butter and cheese salts are similarly made, but are of different sized grains. They pass 40, 30 and 20 mesh respectively. Since one object in salting butter is to remove the butter-milk, the salt should not be in fine powder or small, hard cubes, but in thin, soft, hollow flakes, offering large surface for contact, dissolving rapidly into large drops of brine. Absolute purity is not as essential as correct mechanical condition. There are American salts upon the market equal if not superior to imported salts. Perhaps the most important point in salting, is to look out for taints. Salt is apt to take on a bad odor and to impart it to the butter, and, other

things being equal, an imported salt, owing to carriage in the holds of vessels, is more liable to be tainted than American salt. The amount of salt and of color to be used should be gauged according to the demands of the market.

Butter is worked for two reasons: first, to get out the extra water; second, to pack together the butter granules, thus excluding the air. Both underworking and overworking should be avoided. The former leaves a sticky butter containing much moisture, the latter a butter which has lost its granular, satiny look, becoming sometimes solid and salvy looking. The least possible handling necessary to remove excess of water and properly pack is the best. Butter worked twice is generally drier and less apt to be streaked than a once worked butter.

It is doubtful if the style of butter worker materially affects the butter, and the main points to be considered in choosing are convenience and ability to keep clean. The modes of packing butter vary according to its use. When intended for immediate use, the print is a popular form. At present, however, the small box and ten pound package are the most popular forms, and evidence the tendency of the times to use fresh butter and get nearer the churn.

## XXI. BY-PRODUCTS OF THE DAIRY.

The by-products of the dairy comprise skim-milk, butter-milk, whey, vinegar, casein curd, albumen curd, and milk sugar.

1. *Skim-milk*—This is one of the best and most economical foods for the animal. It is of value for human food, and its sale should not be prohibited for human consumption, as is the case in many localities. Many dairymen feed it to their cows, and it is claimed with profit, and, of course, most calves are brought up by it. It is the best and most economical basis of a ration for growing pigs. A corn diet produces excessively fat pork because of its carbonaceous nature. Skim-milk, however, is a nitrogenous food, and, fed in connection with corn meal or other grain products, produces leaner pork, often at less cost, which commands a higher price. Two hundred pounds of skim-milk are considered for pig feeding to be equal to a bushel of grain. The amount of grain should be increased relatively to the skim-milk as the pig grows

older. In general, below seventy pounds, the pig should get a nutritive ratio of 1 to 3 ; from 70 to 130, 1 to 4 ; from 130 to 200, 1 to 5. The experiments in pig feeding at the Vermont Station for five years past, have indicated a return of 24 cents per hundred pounds for skim-milk fed to pigs, or rather more than 2 cents a gallon.

2. *Butter-milk*—This in limited quantities may be sold in cities for human consumption. It has about the same value as skim-milk in pig feeding, but it is more apt to scour the hog and to cause sickness.

3. *Whey*—Whey has so little nitrogenous matter in it that it alone cannot support life. It is of much less value than skim-milk or butter-milk, but should not be despised. Fed with a nitrogenous grain ration it is a valuable adjunct to the dairy.

4. *Vinegar, Casein and Albumen Curds and Milk Sugar* are as yet upon the market in limited quantities. The latter is largely coming in use in the manufacture of prepared foods and medicines.

## XXII. WASTES OF THE DAIRY.

The wastes of dairying may be summed up under four headings: 1. The keeping of poor cows. 2. The imperfect feeding or handling of cows. 3. The improper handling of the manure. 4. Loss of milk constituents by careless or imperfect handling, resulting in quality and quantity losses.

1. The average amount of butter made per cow in Vermont is 155 pounds. In one town it is but 92 pounds, in another 259 pounds. It is safe to say that one-fourth of the milch cows of the country are kept at a loss. It is also safe to say that an intelligent use of scales and the Babcock tester will readily detect the poor cow. Probably the better half of the cows place all the money in the pocket, since there are many cows giving but slight profit to balance those kept at a loss.

2. Some dairymen feed too narrow a ration, and are wasting much of the valuable protein. Most of the dairymen feed too wide a ration, wasting the less valuable carbohydrates and failing to get full work from their cows. Poor buildings, cold water, exposure, all tend to lessen the vitality of the cow, and to cause her to

give less milk. Clapboards are cheaper than grain to warm a cow.

3. Losses in improper handling of manure. Failure to use absorbents, or to use plaster, allowing the manure to ferment or to fire-fang, failure to save the liquid manure, the losses in the pastures, etc., all count up heavily in the waste of manure. The money value wasted yearly in this State in manures is ten times that spent for commercial fertilizers. These wastes may be avoided largely by proper use of absorbents, by sprinkling plaster behind the animals, by preventing leaching, by frequent carting off the manure, hence preventing fermentation. In general, unless the land is very steep and leachy the sooner the manure is spread on the field the better.

4. Wastes in handling milk. In spite of the large number of creameries and cheese factories in this State, it is probable that fully two-thirds of the milk is still handled at home by the old-fashioned shallow setting system, which has been thoroughly proven to be a very wasteful one, the waste extending to both skim-milk and butter-milk. It is probably not out of bounds to say that the preventible waste of butter in this State is not less than one and one-half million pounds yearly, while the quality losses amount to figures which cannot be estimated. Modern methods, if it were possible to enforce them throughout the State, would probably add nearly ten per cent. to the value of her milk products, and 30 per cent. to the value of the manure now made.

### XXIII, XXIV. FERMENTATION OF MILK.

1. *Causes.*—Two distinct classes of ferments cause milk fermentation, the organized and the unorganized. The former contains minute living organisms, such as bacteria and yeast, the latter are chemical ferments, such as rennet and pepsin. Bacteria are found in immense numbers everywhere, are extremely minute, are generally shaped like a lead pencil (bacillus) a ball (coccus) or a corkscrew (spirillum). They are plants rather than animals, and play an important part in nature. When one is separated from all other kinds the growth is known as a pure culture. Yeasts are a low order of plants, somewhat akin to bacteria.

2. *Fermentation of Milk by Rennet.*—Rennet is made from the stomach of a calf, and coagulates the casein of milk. The

causes of this are rather obscure, but so far as known the casein is chemically changed by rennet, being broken up into two parts. The active principle is one of the digestive ferments of the gastric juice of the stomach.

3. *The Souring of Milk.*—The normal souring of milk is a fermentative process produced by organisms which get into the milk after the milking. There is one species producing lactic acid, common around the dairy but not common elsewhere in nature. This is the most common of acid-producing bacteria in milk but there are several other kinds which may cause it to sour.

4 *Number of Bacteria in Milk.*—These organisms get into the milk from external sources, such as the air, the hands, the hair or udder of the cow and milk pails. If the cow be healthy and the udder not diseased, the milk as it leaves the teat is free from bacteria, hence the number present in the milk will vary with the cleanliness and the conditions of warmth and cold and time of standing. Milk may contain at the point of souring up to a thousand millions or more of individual bacteria. If milk is not cooled at once, for a day or two they increase with great rapidity, then their multiplication is checked and finally they cease to grow. This is due to the accumulation of products of their own action, since they cannot grow in an acid medium.

5. *Relation of Electricity to Souring of Milk.*—It is popularly believed that thunderstorms cause milk to sour, but electric sparks have been passed over and through milk with little or no effect, which conclusively proves that electricity alone cannot sour milk. The connection between a thunderstorm and souring is of different nature. The warm, sultry conditions which usually precede a thunderstorm are favorable for bacterial growth, and it is reasonable to suppose that the climatic conditions which have brought the storm, have at the same time been such as to cause unusually rapid bacterial growth. In "dog day" weather, without thunder, milk soon sours, while on the contrary, milk free from bacteria and milk submerged in cold water, will keep through thunder showers.

6. *Other Forms of Fermentation of Milk.*—The fermentations other than souring have been but recently studied, since the souring obscures much of their work. But it has been found that

various organisms produce various fermentative changes. Our knowledge of these, however, is very incomplete. The most common of these organisms produce lactic acid, another class produces an alkaline action, coagulating the milk in a soft, slimy mass, possessing a bitter taste. The curd soon dissolves in a clear, semi-transparent liquid having a bitter taste, containing peptones, to which the bitter taste is ascribed, and containing ammonia. Other organisms produce butyric acid. They do not, however, occur in normal milk, until the lactic acid bacteria have finished their work. If they be allowed to grow in cream, or, in other words, if cream gets over-ripe, the butter is more liable to become rancid.

Bitter milk is often due to the eating of bitter foods, to the milk of old cows, to the milk of strippers and sometimes to the milk of but one or two teats of a stripper. Frequently, micro-organisms are the cause of the trouble, there being quite a number of species which produce this effect. Some bacteria produce an alkaline curdling of milk. They give rise simultaneously to two distinct forms of fermentation, one producing a rennet-like curdling, the other a solution of the casein. It is believed that they play a considerable part in the ripening of butter and cheese, and that many of the difficulties in the proper handling of these products may be due to the bacteria of this class.

Blue milk is due to a particular species of bacteria, and is also due to lack of care and cleanliness. It appears to be harmless.

Red milk may come from eating madder, from an injury to the udder, or sometimes from bacterial action.

Slimy or ropy milk will not cream, cannot be churned or drank. Diseases of the mammary gland, variations in food and surroundings sometimes cause this, but it is usually due to the action of bacteria. There are several of these different kinds at work. Milk is an excellent medium for bacterial growth, and we understand as yet comparitively little of what happens in fermentation of milk. Among the practical points of this subject which bear upon dairying we may draw the following :

1. All fermentations of milk, even the common souring, are due to the contamination of the milk with something from the exterior after it is drawn from the cow. Absolute cleanliness and low tem-

peratures are the best remedies for too rapid fermentation of milk.

2. All abnormal fermentations of milk may be prevented by sufficient care and cleanliness.

The bacteria are foes to the seller of fresh milk, friends to the butter-maker, and allies of the cheese maker. The ripening of the cream is due to bacterial action. The aroma of butter is undoubtedly connected with the decomposition products of bacterial growth, and certain germs have been found to produce the proper butter aroma, while cream ripened with improper species produces very poor butter. The use of pure cultures in ripening cream is already a practical thing; but, the matter of the production of the aroma by artificial ferments is still in a somewhat intangible shape.

The ripening of cheese has been conclusively proved to be due to the action of bacteria. If fresh cheese be treated with a disinfectant it does not ripen. There may be a hundred millions or more of bacteria in an ounce of cheese. One species in particular appears to be the cause of ripening. There is much yet to be learned, however, along these lines. Poisonous cheeses will probably in time be produced no longer when we have learned to ripen cheese with pure cultures of bacteria.

(Lectures xxiii and xxiv are condensed from Dr. H. W. Conn's Review of Investigations on the Fermentations of Milk, published by the United States Department of Agriculture, and his language used to a considerable extent).

## XXV. CLEANLINESS IN THE DAIRY.

The dairy and dairy utensils should be kept clean mainly to prevent bacterial growth and action. Boiling hot water, steam, air, sunlight, disinfectants, soap and alkali are the best means with which dirt may be fought. Dirt has been well defined to be "matter out of place." In the dairy the dirt, or matter out of place, is very generally of fatty nature, which alkali will best attack.

Perhaps as good an illustration of how to keep clean in the dairy may be found embodied in the rules of the Milk Supply Company, of Copenhagen. This concern supplies its patrons with pure and wholesome milk, receiving it only under the following conditions:

(1) the food must not affect the taste or character of the milk injuriously, (2) the cows must be pastured on clover or grass, without barn feed in the summer-time, (3) they must be clipped on the udder, tail and hind quarters in the fall, (4) the cows must calve evenly throughout the year, (5) colostral and stripper milk is refused, (6) milk must be strained, and in general, the utmost cleanliness observed, (7) there must be 30 pounds of ice used to every 100 pounds of milk, (8) each dairy must have a separator, (9) milk must be at once cooled to 40 degrees F., (10) and be delivered daily, (11) in the Company's cans, (12) which must be thoroughly cleansed at both farm and factory, and well aired, (13) and kept for nothing but milk transportation. (14) The farmer must answer all questions regarding his milk, (15) he must permit the Company's veterinarian to examine his herd, and carry out his directions. (16) Tubercular cows are removed at once, (17) diseased cows are removed at once, and the delivery of milk stopped, (18) when contagious diseases occur on the farm, delivery of milk stops. In each of these two last cases the milk is paid for the same as when it is delivered. (19) A poor quality of milk is refused by the Company without remuneration.

The company employs three veterinarians and a staff of trained dairy maids, who inspect the health of the cattle and the handling of the milk. The milk of each dairy is analyzed. All the milk is filtered twice.

As the public gets educated up to the knowledge of the connection between human and animal diseases, we may expect milk supplies similarly controlled in this country.

## XXVI. DAIRY WHYS?

Hand milking is better than machine milking because it gets more and better milk, owing to the fact that the milk secretion is a nervous function largely excited by the manipulation of the teat. Change of milkers and of quarters usually unfavorably affect the yield, for the reasons that change tends to cause nervous excitement. Change of feed is more apt to change quantity than quality of milk. Changing from poor to good feed, however, may change

quality ; changing from good to good, seldom, if ever. Milk should be removed from the stable at once to avoid contamination of odors. The aeration of milk is beneficial because it cools it, not because of any benefit of mixing with air. Milk creams because of the difference in specific gravity of the fat globule and the milk serum. In deep gravity settings the milk should be set fresh from the cow, because a thermometric fall of 50 degrees is essential for good work. Deep setting is to be preferred to shallow setting if surrounded by cold water, on the score of economy of space. Cold aids creaming by gravity systems, because it retards the growth of bacteria which tend to curdle milk, hinders the formation of fibrin, and increases the difference between the gravities of the fat and the serum. Dilution decreases the viscosity, hence aids creaming, is valuable when ice is short or when cows are strippers, but, at best, is but a makeshift. Water is used to cool milk because it is a better conductor of heat than is air. Round cans are used because the milk is more evenly effected by change of temperature than in cans of other shapes. The separator augments gravity by centrifugal force, hence the better creaming. The microscope and the market price say that the separator does not injure the cream nor break the fat globule. Thick cream is usually churned better than thin cream, in less time, more exhaustively, making better butter. Cream is ripened mainly to produce aroma and is best ripened by the use of pure cultures. Sweet cream butter, if made from raw sweet cream, has no aroma, but may acquire it; from ripened sweet cream it does have aroma. Mann's acid test shows the point where lactic fermentation ceases and butyric fermentation begins. The dash and paddle churn cause incomplete churning. Butter is gathered in the granular form to better separate the butter-milk ; it should not be soaked in water lest the flavor be removed.

These are but few of the many "Whys" of dairying, and but few of those propounded in the lecture.

## XXVII. RELATION OF DAIRYING AND FERTILITY.

The principles underlying fertilization were announced by Liebig in 1840 to be:

"1. A soil is fertile only when it contains all the materials requisite for the nutrition of plants in the required quantity and in the proper form.

2. Every crop removes a portion of these ingredients. A part is added again from the air, another part, however, is lost if not replaced by man.

3. The fertility of a soil remains if all crop ingredients are restored by manure.

4. The manure produced on a farm is usually insufficient to permanently maintain its fertility, since it lacks the constituents annually exported in the shape of corn, hay, milk and live stock."

I wish in particular to call attention to the fourth statement, and show wherein butter dairying is the salvation of worn out and exhausted lands. The farm which exports butter only, sends from the farm only carbon, hydrogen and oxygen, elements obtained from the air. Grain, hay, wool, milk and live stock all contain largely of nitrogen, phosphoric acid and potash, which are the three costly and commercially valuable constituents of fertilizers, and their continued sale, using simply the manure left, will ultimately exhaust a soil, no matter how fertile. But the making of butter, feeding the skim-milk and butter-milk upon the farm, not only keeps all of those three ingredients at home, but there is in addition the ingredients brought on to the farm, in the shape of grain fed upon it. A hay or a grain farm is, as a rule, continuously growing poorer; while a butter making farm is, as a rule, continuously growing richer. An example of this may be quoted. The State Board of Agriculture recently held a meeting in a town which for forty years had been shipping hay and oats. The universal complaint was "hard times" and "exhausted lands" and both the farmers and their homes showed the pinch of poverty. They were universal in their assertions that they were poor farmers, poor in pocket and poor in practice. A few weeks later a meeting was held in another portion of the State where good times, cheerfulness and comfort abounded. This town made butter its main export. Almost every acre of the first town was tillable, one of the best located towns with naturally good soil in the State. The other was a typical Vermont hill town, with rough and rugged land. It was simply the

difference of skinning the farm by the sale of nitrogen, phosphoric acid and potash in the sale of hay and oats, and enriching the farm by the sale of carbon, hydrogen and oxygen, all air giving elements costing nothing, in the shape of butter, and the enriching of the lands with the manure obtained from the cattle feeding.

### XXVIII, XXIX. CATTLE FEEDING.

The animal body and the milk obtained from it are made up of four classes of substances: water, mineral matter, nitrogenous matter and fat. The milk also contains carbonaceous matter in the shape of milk sugar. The food fed to these animals which builds up their bodies and from which milk is formed contains these same materials. To keep the animal healthy and to keep up the milk flow there must be a constant supply of new material. In its absence, hunger, and finally death result. Food keeps up this supply, maintains the heat of the body, furnishes force or energy, enabling the animal to move, to work, to perform the daily functions and to make milk or growth. Scientific feeding is the supplying of food in the right proportions without waste, and may be worked out by study of food compositions, amounts digested and the animal requirements. Food contains: (1) Water. However dry food may seem to be, it always contains water, invisible but capable of being driven off by heat. It has no food or commercial value. (2) Ash, or mineral matter, consists mainly of lime, magnesia, potash, soda, chlorin, carbonic, sulphuric and phosphoric acids. Its main use is in making bone. (3) Fat, including waxes, chlorophyll, etc., which is either stored up in the body as fat or burned to furnish heat and energy. (4) Carbohydrates, including materials such as starch, sugar, gum and fibre. These form the largest part of the dry matter of vegetable foods, and are either stored up as fat or burned to produce heat and energy. (5) Protein or nitrogenous materials constitute the flesh forming food from which flesh, blood, skin, nerves, wool, etc., are made. This material is indispensible. No other substance can take its place. It may form fat in the body, probably does form fat in the milk, and may be burned to furnish heat and energy. Fat may be stored up from the last three constituents, and their combustion

furnishes heat and energy, but flesh is built up from the last alone.

The composition of foods is determined by chemical analysis, the digestibility by analyses and weights of materials eaten and excreted. The digestibility varies greatly in different animals and different materials. Average American analyses of foods may best be determined by reference to Bulletin 11 of the Office of Experiment Stations, the digestion co-efficients and amounts by reference to the publications of the same office. Long series of experiments, mainly in Germany, have indicated that different animals, under different conditions, need for their best growth and work certain proportions of protein, carbohydrates and fat. These proportions have been worked out per cow and per thousand pounds of live weight into a table called Wolff's Feeding Standards. These indicate for the milch cow, for instance, that a thousand-pound animal should eat per day 2.5 pounds of digestible protein, 12.5 pounds digestible carbohydrates and 0.4 of a pound digestible fat. This ration has a nutritive ratio (i. e. proportion of protein to carbonaceous material) is of 1 to 5.4, and a fuel value of 29,588 calories. These standards are not meant to be cast iron rules to be blindly followed, but to be guides pointing the way toward rational cattle feeding. It is probable that the German standard for milch cows is too narrow a ration for most American conditions. One to six would probably be better. The calculation of rations is not difficult if one possesses (1) weights of the various foods, (2) their analyses, or the average analysis of such materials, (3) the digestion co-efficients, that is to say the digestion of the various ingredients of the various foods fed. The First Annual Report of the Vermont Station contains all of this data, with some twenty pages of printed matter explanatory and illustrative of the same.

The rations commonly fed cows have too little protein and too much carbohydrates. The protein is the most costly ingredient, it is what makes the cottonseed, linseed and gluten meals so valuable, and may best be introduced upon the farm by growing more leguminous crops, such as clovers, soja beans, horse beans, vetches etc. These not only contain relatively large amounts of nitrogen, but derive most of it from the air, requiring little nitrogenous manure.

The soil, the ration and the manure are thus enriched with atmospheric nitrogen, costing the farm nothing, while the mechanical and physical condition of the soil is also improved. The manurial value of the crop is an important factor to be considered in selecting crops for growth or feeding. From three-fourths to nine-tenths of the fertilizing constituents of the food may be recovered in manure properly cared for. Few realize the wide difference in the value of manures from different feeds. At current prices for fertilizers a ton of hay contains $6 worth of fertility; of clover hay, $9 worth; root crops, $1 worth; of corn meal, $7; wheat bran, $13; gluten meal, $16; cottonseed meal, $24. Assuming three-fourths to be recovered in the manure, one can readily calculate the net cost of the food.

As good a short article on feeding farm animals as has been printed is that written by Prof. W. A. Henry, Director of the Wisconsin Station, and published in the Report of the Bureau of Animal Industry, of the Department of Agriculture; entitled "The Feeding and Management of Cattle." This may be obtained free, on application to the Bureau.

## XXX. PAST, PRESENT AND FUTURE OF DAIRYING.

Dairying dates back to the remotest antiquity. In the Bible we learn from the writings of Moses that "man was given dominion over all cattle," that "Abraham was very rich in cattle, in silver and in gold," and it is said that "he entertained three angels with a calf, tender and good, dressed with milk and butter." Jacob's experience in cattle breeding is known to all. Among the proverbs of Solomon we find one as applicable to-day as when it was written. "Be thou diligent to know the state of thy flocks, and look well to thy herds." The Egyptians deified the bull. The Greeks, Romans and Norsemen were all acquainted with cattle breeding and with butter. In the middle ages butter was considered a medicine. Jersey cattle date back to 1734. At present, in some localities, dairying is no more advanced than it was before Christ, and in civilized communities the old dash churn and the shallow setting of our ancestors, still hold sway. The true present of dairying, however, is the separator, the deep setting, the creamery, the

cheese factory, the milk tester, the scales, and the production of more and better goods. The better class of creameries and dairies are now sufficiently well equipped from a mechanical standpoint so that but little loss of fat need be incurred from cow to butter tub. The quality of the product is better than formerly, and the production of butter per cow is steadily increasing. The future of dairying is full of hope. Although we have increased in dairy knowledge very rapidly during the present generation, particularly in the lines of the handling of milk, yet there is far more to be hoped for in the future. Among the advances in the more or less remote future will be the universality of from 200 to 300 pounds per cow dairies. Perhaps this, together with the preservation of the health of the cattle, is the greatest step in advance for the dairymen yet to take. Sweet cream butter, either from raw sweet cream via. extractor, continuous churn or accumulator, or ripened sweet cream butter churned without acid at a low temperature, is coming. Yet it is doubtful if the general market will take sweet cream butter to any extent during the next fifty years. The universal use of pure cultures of the proper bacteria in butter-making may be expected in the near future, and is now an accomplished fact in Danish dairies. A more rapid consumption of butter will prevail, or, in other words, the consumer will get closer to the churn, and the butter of to-day will be on tomorrow's table. Factories will be controlled by syndicates, and there will be inspection of factories, dairies and cows by private or public enterprise, with milk testing by experienced and impartial hands. Finally there will be fifty dairy schools where there is now one, both stationary and traveling, and, in general, dairy intelligence brought home to dairymen, and the upshot of it all will be more of a better and more uniform product.

## LECTURE COURSE II.

### JERSEYS.

By HON. H. W. VAIL, Member State Board of Agriculture, and late of the Board of Directors of American Jersey Cattle Club.

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Civilized man, by careful breeding and selection, has changed all domestic animals into special animals designed for definite purposes. This may be instanced by the hen, dog, horse, cow, etc. There is economy in using special animals, since they are able to do better work at cheaper prices. The claim made for the Jersey cow is that she has been specially bred in butter lines. Other breeds of cattle have their place and economic use, but the Jersey is preeminently the butter cow.

The natives of the Island of Jersey early made butter for the Paris markets, and through their shrewdness in examining and testing their cattle the quantity and quality of their products improved, and they originated what is now known as a thoroughbred live stock. The early importations of Jerseys to this country were gentlemens' cows, but on the foundation of the cattle club the color standard was abandoned and her usefulness as a special butter cow was made the basis of judgment. The American Jersey is superior to the Island Jersey in that she is capable of greater assimilation and production, and is a triumph of breeding skill. There is difference of opinion regarding the question how far we can stimulate the artificial features of her nature and not injure her constitution. It is a question whether in high breeding and feeding we detract from her vitality or not. My personal opinion is that care does not make a cow less healthful. By the use of a thoroughbred sire, stock may be more thrifty and more rapidly improved. Pedigree is valuable, but should not be considered a guarantee. The laws of breeding are that like gets like, and an animal having tested ancestors is most liable to beget valuable offspring.

The larger the percentage of butter fat in milk, other things being equal, the cheaper the butter is produced. Progressive dairymen of the country, as a rule, tend toward Jersey stock. The World's Fair test recently finished has again confirmed the special fitness of the Jersey as a butter breed, and thoroughly established the fact that it is possible for cows, even in unfavorable conditions, to make what has been considered fabulous amounts of butter in a day.

### Discussion—JERSEYS.

Mr. Terrill—Is there any particular family of Jerseys which is stronger than others?

Answer—We know but little of this matter. We are apt to confuse size with coarseness. Some of my cows with the strongest constitutions and good digestive capacity, are small and light animals. Families and sub-families have their peculiarities and various money values. In the Chicago test there were representatives from all of the better Jersey families of America.

Mr. Lord—What was the per cent of fat in the Jersey milk at the Chicago test?

Answer—Many tested 6.00 per cent.; some 5.00 per cent. A two-year-old tested from 5.30 to 5.80 per cent.

Mr. Lord—Which was the best, all-around cow at Chicago, for butter, cheese and everything?

Answer—A Jersey named Ida Marigold.

Mr. Davis—What is the average test of your dairy?

Answer—I do not know. It takes about 16 pounds of my milk to make a pound of butter. I have a three-year-old, just come in, giving 26 to 27 pounds of milk, and making two pounds of butter a day. I call my standard an ounce to a pound, one ounce of butter to a pound of milk.

Mr. Davis—Which would you prefer to make from a cow, forty pounds of milk giving two pounds of butter, or twenty pounds of milk giving the same amount?

Answer—The latter, as it would take less food to make it.

Mr. Lord—Would not the extra amount of skim-milk offset this?

Mr. Vail—No, it would not. Its value would not equal the extra food eaten.

Mr. Waters—What is the value of skim-milk as fed to hogs ?

Answer—I cannot say, I will refer to Prof. Hills.

Prof. Hills—In our feeding experiments for several years past the skim-milk has returned to us about 25 cents per hundred pounds.

Mr. Waterhouse—In the feeding at our creamery we have been able to figure out its value at 22 cents.

Mr. Terrill—Which is the more valuable for feeding hogs, skim-milk or whey, and why ?

Prof. Hills—Skim-milk, because it contains the nitrogenous or flesh forming materials which in the case of the whey have been made into cheese.

Mr. Terrill—What is the average life of the high producing Jersey cow ?

Answer by Mr. Vail—I have had some cows in my herd from fifteen to eighteen years old that were still profitable milkers. I do not as a rule advise milking so far along in years as this, but they have done well. The average life of some is pretty short. Some are killed by high pressure. But their owners have received their value over and over again for the sale of their descendants. Eurotas, however, some years after her great test was still a fine looking cow, and many other great cows lived and did good work for many years after phenomonal tests.

Mr. Lord—I believe the Jersey is the best butter cow, but I condemn her for cheese. I believe that a milk containing more than 4.00 per cent. of fat is not advisable for cheese making. It must be over-salted or else it will spoil.

Mr. Vail—On Wednesday morning last, Mr. G. A. Smith, Director of the New York State Institutes, gave an address on cheese making before our Dairymen's Association, and stated that with the modern methods of cheese making it was possible and practicable to incorporate the fat of 6.00 per cent. milk into cheese and make a superior article. Whether this is advisable or not is a matter to be decided in accordance with the relative market prices of butter and cheese.

Mr. T. G. Bronson, of Hardwick. I would say that Mesinna, sixteen years old, tested 16 pounds of butter per week, that Lady Lightfoot, at twenty-two years, still breeding, tested 14 pounds in two weeks some years ago.

Mr. Vail—It is a difficult thing, and a wonderful performance to force a cow up to her full capacity of butter production for a full year. In my opinion it is greater than forcing the horse to trot in two minutes. It is the same idea of stimulating the special function. We should remember, however, that it does not improve a driving horse to continually race him, nor does it improve a cow to force her under high pressure to enormous production.

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## Milk Fever.

By F. A. Rich, V. S., M. D. Veterinarian of the Experiment Station and Instructor in Veterinary Science, U. V. M., and S. A. C.

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The veterinarian recognizes under this general head several diseases which are closely akin and all of a parturient nature. The term is really a misleading one, inasmuch as 30 per cent. of the cases are without fever, and have a temperature below normal.

There are at least five distinct parturient diseases: 1. Parturient Fever. 2. Parturient Paralysis. 3. Parturient Apoplexy. 4. Parturient Metritis. 5. Parturient Peritonitis.

1. *Fever*—This, the simplest of all, is called milk fever by veterinarians, is an indicator of a deep milker, and is usually caused by high feeding before calving, and too high nutrition. It begins before calving, with slight fever and caking udder.

2. *Paralysis* is due to the congested state of the spinal cord, or its coverings, vessels of which may become ruptured, causing also apoplexy. Its course may be short, the cow being taken sick recovering in a few hours, or, on the other hand, dying in a few hours; or, the cow may linger several days and then die or get well. The symptoms are chill, diminished or suppressed milk flow, uneasiness, "paddling" with the hind feet, and finally the cow gets down. During all this her head is up and eye clear.

3. *Apoplexy* is a more fatal form of the disease, and like other parturient diseases is due to high feeding, fresh grass, undue exercise, or overdriving soon after calving. Cows over three years old are more liable to have this than two-year olds. Symptoms are the same as in the paralytic form. In general if there is suppression of milk inside of three days from calving, there is great danger of a parturient disease, usually of the paralytic or apopletic form. The estimate as to probability of life or death (prognosis) is to be largely based on the length of time elapsing between birth and the occurrence of the disease.

4. *Metritis* is generally due to the retention of some of the placenta. The milk flow is diminished, is often blue or red in color, and there are dark, fetid and irritating discharges. The cow needs skilled care and attention, comfort in general, possibly injections of laudanum to allay pain, and the services of a veterinarian.

5. *Peritonitis* is an inflammation of the whole lining of the abdominal cavity. This form of parturient disease closely resembles that found in the human family, is very fatal, and usually due to injuries received during calving or to retention of portions of the placenta. All or any of this class of disease may be caused by exposure on the damp ground. Symptoms are much the same as in the other parturient diseases, except that the pulse is wiry and the pain more marked. The cow rolls, stamps, kicks at the abdomen and usually dies within twelve to forty-eight hours.

The best thing to be done in these diseases, if taken in time, is to bleed in order to relieve congestion. If, however, the cow is down, bleeding is injurious and cathartics of not much use, yet salts, act well if bowel paralysis has not set in, in which case they are useless, although they may sometimes be inserted by puncture into the rumen. Injections of warm, even hot (120°) water are useful. In apoplexy a strong pulse indicates cold water to the head; a weak pulse, warm water. In sinking, injections of warm water or alcoholic stimulation.

It is often hard for the casual observer to distinguish between these diseases, and veterinary advice is needed, but it is well, perhaps, that all be in a measure fitted to judge of their nature, know the organs involved and the better general lines of treatment.

Discussion—MILK FEVER.

Mr. Terrill—Is a bran-mash good in cases of milk fever?

Answer—Bran-mash is easily assimilated, causes an increased amount of blood to form rapidly, hence, beyond its laxative effect, it is injurious.

Mr. Lord—Would you feed rye meal?

Answer—I do not like rye under these circumstances. It is too highly nutritious. Scalded oats are good. In general, one should give easily-digested food at such times.

Question—Is it well to have a cow gaining flesh just before coming in?

Answer—No. Let her just hold her own. A gain of flesh means gain of blood, which is not always desirable at such times.

Mr. Terrill—I grain two weeks before calving, and believe it to be successful.

Question—What directions would you give regarding watering a cow having milk fever?

Answer—I would not give very much. It does not make much difference whether it be warm or cold, if the cold be given in small quantities.

Mr. Howe—What is the effect of taking the calf away from the cow, as regards this disease?

Answer—It is demonstrated beyond question that any exciting cause, such as taking away the calf, is apt to bring on this disease. A recent example of this came to my knowledge where a goat in good health had her kids taken away the third day from birth. She mourned excessively and soon became totally paralyzed, a reflex action caused by her trouble.

Mr. Davis—How late would you milk a cow?

Answer—This depends upon the individual cow. Most cows, however, should have six to eight weeks rest.

Mr. Bailey—Is there any relation between garget and milk fever?

Answer—Inflammation of the mammary gland may be local or general, superficial or deep seated. Simple milk fever and garget are somewhat related to each other.

Mr. Lord—What is the remedy regarding it?

Answer—This depends upon its form and cause. Probably tuberculosis is the primal cause of a large amount of garget. The treatment in mild cases is to give laxatives and put on hot fomentations. Give fluid extract of garget root. In chronic cases give potassium iodide in dram doses.

Mr. Dole—Is saltpeter good for garget?

Answer—I think it is too stimulating to the kidneys.

Mr. Waters—Does not saltpeter cause shrinkage of the milk?

Answer—Yes, if given in large doses it does indirectly through its effect upon the blood. Bloody milk is one of the first indications of garget. Saltpeter should be used sparingly, in my opinion, as it is apt to cause acute Bright's disease.

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## Dairying for the City Market.

By Hon. J. O. Sanford, Member of the State Board of Agriculture.

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There are many men engaged in making the products of others into money, and it behooves every man to endeavor to get as close as possible to his customer and take for himself so far as he can all the profits. This pertains to dairying lines as well as to others, and for such as are favorably situated, and are able to do it directly, supplying all dairy products to the consumer without their passing through the hands of a middleman, is to be desired.

I can perhaps best illustrate this matter by giving my own personal experience. I live within five miles of the large Massachusetts town of North Adams, and deliver butter weekly to my customers. This method of marketing butter has its advantages and disadvantages. The disadvantages are: (1) The necessity of having constant supply. One must regulate the herd, and always have enough. The city trade is liable to use less in summer than in winter, because of the departure of so many people on vacations, and it is frequently the case one has surplus butter in the summer. We sometimes have to buy cows or buy butter for the family in the

winter to keep up the supply. (2) The expense and trouble in providing the necessary equipment. We now put our butter up in pound prints, place in four-pound tin boxes and put in a carrier lined with galvanized iron, containing a galvanized iron box at the top which holds ice. (3) The necessity of spending considerable time.

The advantages are: (1) All the profits come directly to the seller, and average perhaps five cents per pound more. (2) The opportunity afforded of disposing of other farm products, such as vegetables, eggs, etc. (3) The excellent opportunity afforded for the study of human nature. My experience has led me to believe that for such as are favorably situated this is the best and most desirable method of disposing of dairy products. If, however, one is not thus favorably situated, the next best method of disposing of the product is through a first-class grocer in some large town or city. However the material is handled, it should be put up in uniform fashion and every effort made to secure the best possible article. I have had no trouble in obtaining for my butter seven cents above the market price, selling at thirty cents in the summer and thirty-five in the winter.

### Discussion—Dairying for the City Market.

Mr. Prime—Did you ever use the Reid butter boxes?

Answer—I have not, but think them excellent for shipping butter.

Mr. Robinson—Do you wrap your prints at once?

Answer—No, I allow them to drain first.

Question—What shape print do you use?

Answer—Brick shape.

Mr. Waters—If one's farm is within a mile of market, is butter or milk more profitable?

Answer—That is a big question. My neighbors are selling their whole milk, but I find a good market for both skim milk and buttermilk, and, as I figure it, get a larger money return from the sale of butter, skim-milk and butter-milk than they do from the sale of milk alone, allowing a liberal estimate, moreover, for the manufacturing.

Prof. Hills—What percentage of bad debts do you have?

Answer—Payments are made weekly or monthly, and the percentage is small.

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## The Indian Corn Plant.

By Pres. Henry E. Alvord, Special Agent of Department of Agriculture, having charge of the Collective Exhibit of the Agricultural Colleges and Experiment Stations at the World's Fair. Late President of the Maryland Agricultural College.

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The principal points presented follow:

1. Something of the origin and history of maize. 2. The many uses and great value of the plant, and its new and increasing usefulness. 3. The place of corn in American farming. 4. The yield in total crop and food material compared with other forage plants. 5. The relative value of the different parts of the corn plant. 6. The different parts of the stover or stalks compared, and especially the relative value of the butts. 7. The fact of frequent wastes of parts of the stalks, particularly the butts. 8. Evidences of food material in the wasted parts. 9. The value as food of this portion so often wasted. 10. The probable extent of this loss and its gross amount.

The important question then presented is, can this loss or waste be avoided?

Can the food material which actually exists in this portion of the corn plant, so often rejected or wasted, be utilized so as to be made available to farm stock in any practical, economical way?

The answer is emphatical that this can be done, and several methods are mentioned of preserving corn stalks and of using them so as to avoid most of this waste if not all of it. For example:

Thorough curing and proper housing of the stalks for food will save part of the loss over less careful methods. Cutting such good stalks in short lengths and feeding dry. The cost of cutting is well repaid, and from one-half to two-thirds of the usual loss thus

saved. Crushing and shredding the stalks instead of cutting them and allowing to lie in a pile and soften by slight fermentation, will save from two-thirds to seven-eighth of the usual loss. The adoption of the silo system for storing, preserving and feeding the corn crop will save nine-tenths of the usual loss, and in many cases the whole of it.

The food material is in the stalk and is digestible. It is only a matter of changing the mechanical condition so as to render the stalks edible and palatable. This can be economically and easily done so that from one-half to the whole of the usual loss can be prevented.

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MATURITY OF CORN.

| Crop per Acre. | Ears Silking. lbs. | Glazing. lbs. | Ripe. lbs. |
|---|---|---|---|
| Green | 15.232 | 16.013 | 12.103 |
| Field cured | 2987 | 4053 | 5675 |
| Digestible matter | 1978 | 2869 | 4024 |

COMPARISON OF CORN AND OTHER CROPS.

| Plants or Items. | Crop per Acre. Av. 5 yrs. | Part or per cent of total crop. | Food yield field cured Dry Matter. | Per cent. of Dry Matter Digestible. | Yield of Digestible Matter. lbs. |
|---|---|---|---|---|---|
| Mixed Hay | 4000 | ---- | ---- | 51.3 | 1772 |
| Clover Hay | 4000 | ---- | 3496 | 52.5 | 1836 |
| Timothy Hay | 4000 | ---- | 3556 | 53 | 1892 |
| The Corn Crop | 6172 | 100 | 4584 | 69 | 3172 |
| Corn Ears | 2556 | 43 | 2013 | 76 | 1530 |
| Corn Stover | 3516 | 57 | 2571 | 62 | 1642 |
| Corn Blades | 332 | 5.4 | 306 | 64.5 | 197 |
| Corn Tops | 936 | 15.2 | 819 | 55 | 450 |
| Corn Husks | 642 | 10.4 | 591 | 72 | 426 |
| Corn Butts | 1606 | 26 | 855 | 66.5 | 569 |

### Discussion—Indian Corn Plant.

Mr. Terrill—Do you advise shredding or cutting corn for ensilage?

Answer—I do not know that there is much difference. The ensilage being succulent, there is but little danger of sore mouths from sharp edges.

Mr. Day—In case of frost, what system will best handle the corn plant?

Answer—The silo.

Mr. Lord—In case the corn has ripened, will it not pay to cut and steam the fodder as compared with feeding it cut and uncooked?

Answer—It has been very thoroughly proven that cooking does not add to the digestibility of a food, but usually lessens it. However, it may make it more palatable and so cause the cow to eat more.

Mr. Waters—What is the difference in feeding value of the different varieties of corn, particularly the Flint and sweet corn?

Answer—There is more sugar in sweet corn than in the others, but that has but little feeding value. There is no great difference between the feeding value of the dry matter of the various varieties at the same stages of ripeness. We had unsatisfactory results at the Maryland Experiment Station in trying to ensilage sweet corn.

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## Ayrshires.

By Hon. C. M. Winslow, Secretary State Board of Agriculture, and Secretary Ayrshire Breeders' Association.

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The Ayrshire originated in the County of Ayr, Scotland, and has been bred in her purity for over a hundred years in her native home, and was early in the present century imported into the United States and Canada to improve the native stock of these countries.

She is strictly a dairy cow, and is usually kept outside cities and large towns to produce milk. She is eminently fitted to do this profitably, both on account of her medium size, easy keeping qualities, and the peculiar adaption of her milk to the needs of the milk-man. The cow is a large producer for food consumed. The milk is evenly balanced in fat and casein, making it easily digested. The cream rises slowly and is easily remixed with the milk, making a uniform milk for table use. The milk bears transportation without separation of the butter, thus making both cow and milk profitable for the milk-man. If a separator is used, she is a profitable butter cow, but is best adapted to the milk dairy.

The Ayrshire cow, both as pure bred and grade, is equally sought in the city markets, and brings a few dollars more than the highest market price.

She is attractive looking and pleases the eye of the buyer, and every appearance about her indicates a milker. Her strong constitution and healthy appearance strongly recommend her as a producer of milk, wholesome and healthy, free from any danger of giving disease.

### Discussion—Ayrshires.

Mr. Davis—How do you figure your butter record from the Babcock test?

Answer—By adding one-fifth to the butter fat, or, in other words, calculating that 100 pounds of fat, properly handled, will make 120 pounds of butter.

Mr. Howe—Do not the Ayrshires have too short teats?

Answer—The Scottish Ayrshires do, but the American breeders have bred for longer teats to suit American milkers. One must use a little care or there will be a tendency toward a short teat. The reason for this is that the Scottish milk-maids used to milk with thumb and finger alone.

Mr. Day—What is the cost of production of Ayrshire milk as compared with that of Jersey milk?

Answer—The average Ayrshire will produce more milk and more milk solids for a dollar's worth of food than the Jersey. I do not know, however, that this is true of butter fat. The Jersey

stands first for butter, but in my opinion the Ayrshire outranks all breeds in the economical production of milk of good quality. There is no reason for any quarrel between the breeds of cattle. They all have their place. The Ayrshires have not been bred as the Jerseys for the special development of butter-making capacities, but have been bred with the idea of making deep and persistent milkers.

Mr. Lord—Is it true that the Ayrshire cow is more hearty than some other breeds?

Answer—It is.

Mr. Day—Do you think that the milk standard of the State of Massachusetts is too high?

Answer - I do not, although it worries the owners of Holsteins.

Mr. Lord—Does the Ayrshire fat readily?

Answer—When the cow is in milk she is generally thin, but will fat up quickly; in a month or six weeks after becoming dry is fat enough for market.

Mr. Lord—Does she hold out well in her milk flow?

Answer—This we claim to be one of her remarkable features.

Mr. Terrill—Why did not the Ayrshires enter the dairy test at Chicago?

Answer—Simply and solely because the western members of the Association did not subscribe money enough to admit of a representative herd being entered.

Mr. Davis—Can the average Ayrshire make a hundred pounds of butter as cheaply as the average Jersey?

Answer—I cannot say.

Mr. Davis—On what should be laid the most stress, the scoring or the dairy qualities of the cow?

Answer—The score card indicates the type for which we should breed, yet the cows scoring the best do not always turn out the most product.

Prof. Hills—Will the milk and butter yields of a cow receive points on the score card of the future?

Answer—The score card is an old Scottish card somewhat modified for American use. It is now time, in my opinion, to place the performance of the cow upon that card, and I believe a change is coming in that direction.

Mr. Prime—How much milk will the average Ayrshire give?

Answer—From twenty-five to thirty-five pounds a day, and from forty-five to fifty when in full flush of milk.

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## Experiment Station Herd.

By Mr. D. D. Howe, Superintendent of Experiment Station Farm.

I have known the herd of the Experiment Station for about two years, and have been in charge of it for nearly that length of time. Since I have taken charge of them all the members of the herd have been kept in as clean a condition as possible by the use of the curry comb and brush, and have been kept free from lice. I do not know that they give any more milk or butter in consequence of this, but feel sure that they give no less, and that the quality of the product is better. I am a thorough believer in keeping cattle in as cleanly a condition as possible, also in letting them have all the fresh air and sunshine that they can up to the point of overexposure. Previous to my taking charge of the herd, and for a while after it, the cows did not leave the stanchions from the time they came in in the fall until they went out in the spring. Now, and for some time past, they are turned out every pleasant day in the winter for a short time.

The cattle have not in any case, except when under experiment, been overfed. The standard grain ration has been four pounds of bran and four pounds of corn meal, which is probably not a balanced ration, but is used as a standard with which compare other things.

We lay much stress upon good care and kindness. We prefer to have our cattle our friends. So far as I have been able to see to it there are no harsh words spoken or blows struck. Kindness pays in every way, and, on the contrary, abuse does not. When we took the non-tuberculous cows to another barn the cow Bonnie resented the change and made much trouble in the transfer. When I saw her on the way she was being kicked to make her go. She has

since she went to the old barn shrunk half in her milk, which I think is largely due to the abuse she was subjected to in the change. In times past I know we have had calves abused and they have not done well. This past year the calf we raised was petted, and whether this be the reason or not, at any rate, she has done finely.

Referring to the records of the herd for 1892-3, we see that the regular members of the herd have made about 350 pounds of butter per year per cow. Every cow has been far above the average of the State, yet there is much choice between these. The difference between the best and the poorest is the difference of many dollars. I think that with perhaps one or two exceptions all of our cows have been fed at a profit, except perhaps when they were on experimental foods.

### Discussion—Experiment Station Herd.

Mr. Lord—I believe that during the warm winter days it is well enough for the cows to be out at noontime for a while. They should not be allowed to lie down, lest they take cold.

Question—Do you feed ensilage twice a day ?

Answer—Only when on experimental work. Ordinarily we feed at night only, putting the grain feed on ensilage.

Mr. Robison—Do you put the cow in a box stall at the time of calving ?

Answer—Either in a box stall or in a pen by herself for two or three days.

Mr. Terrill—How would you kill or prevent lice ?

Answer—By thoroughly washing with strong infusion of tobacco, and by keeping the cows well carded. I think burning sulphur in the barn occasionally helps kill them.

Question—Can you raise calves on butter-milk ?

Answer—I have never tried. We use separator skim-milk. I feed the calves more or less linseed meal, giving one or two teaspoonsfull at first and increasing to a handful. We feed the milk sweet. They take about half a pailfull when three months old.

Question—What is the feeding value of barley meal ?

Answer—I do not know. I like it, but I think oats are better.

Mr. Lord—I like barley meal, and believe it as good for the milk flow as any grain ever fed.

Mr. Dean—Would you feed green barley or green oats to cows on pasture ?

Answer—The cows generally relish such things, and I would rather feed it than winter rye.

Mr. Storrs—What do you think of peas and oats as a winter grain feed, the crop being ripened, threshed, and the grain ground ?

Answer—This makes a good feed, but I am certain it would prove more economical to ensilage or make hay of the entire crop.

Prof. Hills—Will you give the experience of the Station herd last summer on eating ensilage as a summer soiling crop ?

Answer—Part of our herd were fed ensilage from the silo, and part fresh fodder corn, the test beginning in the latter part of August. Those receiving fodder corn shrunk in their milk. In a short time the parts of the herd were reversed, those receiving fodder corn getting ensilage, and those receiving ensilage getting fodder corn. The former lot increased, the latter part decreased in quantity of milk. This seems to indicate that ensilage is a better summer soiling crop than freshly cut corn fodder.

Mr. Terrill—If one has a crop of peas and oats, the oats being in milk and the peas being in edible state, would you feed green or cut into the silo ?

Answer—I should cut into the silo. I believe it would save time, which is said to be money.

Mr. Robison—Do you advise weighting the silo ?

Answer—I do not think that as a rule it pays to heavily weight the silo. I think it well sometimes, however, to cover with cut hay or straw, or something of that kind.

Mr. Terrill—In the Robertson ensilage are the stalks of the sunflowers used ?

Answer—No, only the heads.

Prof. Hills—The stalks of sunflowers have hardly more feeding value than sawdust. The heads, however, particularly the seeds, are very rich in protein and in fat.

Mr. Robison—Were the sunflowers expensive to raise, and was the yield a good one ?

Answer—We had one-tenth of an acre of sunflowers, and from it cut as large a load of heads as a two-horse wagon without sideboards could hold. There were five and one-half tons per acre, containing about 25 per cent. dry matter.

Mr. Slack—Does not your ensilage rot around the edge ?

Answer—It does in our east silo, but not in the other two. The east silo is rather more exposed on the back side than our other silos, and we have never been thoroughly successful in keeping the ensilage in the corners of this silo.

Mr. Terrill—Do you allow the corn to be highest on the edge or the center of your silo ?

Answer—We keep the edge down by thorough treading.

Mr. Terrill—Do you keep a man in the silo all the time ?

Answer—Yes, and keep him moving.

## TUBERCULOSIS.

By Dr. F. A. RICH, Instructor in Veterinany Science, etc.

The disease known as tuberculosis, or, as it is commonly called in the human family, consumption, has been known for some four thousand years. It is no new disease, but in some respects has come into greater prominence within the last few years, through a better understanding of its causes, symptoms, means of diagnosis and efforts to cure.

1. *Cause.*—Although so old a disease, its true cause was not demonstrated until 1882, when Dr. Robert Koch, of Berlin, demonstrated beyond all doubt that a bacillus which he named Bacillus Tuberculosis was the sole and only cause. Having this knowledge we are able to group together many diseases as tubercular, they being but different manifestations of one and the same disease in different organs, the existing cause in each case being the tubercular bacillus. No matter what the predisposition or bodily condition may be, it is as absolutely impossible to have a tubercular dis-

ease without presence of this bacillus, as it is impossible to grow a crop of corn without seed. It is known that at least 15 per cent. of the deaths of the civilized world are due to tuberculosis. Thousands are cured of some of its manifestations, and probably a large proportion of children dying of bowel trouble really die of tuberculosis of the bowels. Scrofula, water on the brain, hip-joint disease, white swelling of the knee, lupus and many bowel diseases are simply manifestations of tuberculosis in these various organs and parts of the body. It is often acquired through living with tuberculous people. Formerly the disease was thought to be hereditary. It is now quite confidently asserted that this is not the case, but that a predisposition may be hereditary, or it may be acquired. Acquired predisposition may come through mal-nutrition, lack of food, improper food, depressed condition of the body, lung disease other than tuberculosis, etc., and the predisposition may be either permanent or temporary. It is thought by many of the profession that a large proportion of tuberculosis in the human family comes from the consumption of tuberculous meat, milk and milk products. Meat is not as apt to cause it as milk and its products, because meat is cooked more or less, while milk is taken into the system raw. When we consider the universality of the use of milk, butter and cheese, and how many cattle that are being found to have disease of the udder, and the fact that few, if any of us, do not at sometime become at least temporarily predisposed, it is no wonder that the disease is so rife in the human family. Children in particular are very susceptible, and it is always best to sterilize or pasteurize the milk fed to children.

2. *Lesions and Symptoms.*—The disease may involve any tissue of the body, and in general the type of the disease is of an inflammatory nature. If the infection is by the breath the animal gets primarily diseased lungs and bronchial tubes, with sometimes nodular pneumonia and pleurisy. The bronchial mediastinal glands between the lungs strain out the impurity, and themselves become caseous and calcareous. If the infection is by way of the alimentary canal the post-pharyngeal gland, the lymphatic glands of the intestinal canal, and the mesentery (membrane of the bowels) are affected with tubercles and ulcers. In cattle the mam-

mary glands and lymphatic glands connected with them are very apt to become affected. In the cattle recently killed at the Station about 75 per cent. had trouble with these glands. The kidneys, liver, heart, spleen, etc., are very apt to be affected and to break down with abscesses containing pus, caseous matter or yellow specks. The symptoms of the disease are usually those of the organs affected, and it needs a most careful physical examination to detect the disease, and even this often fails.

3. *Means of Detection*—Since this disease in cattle may exist for years without showing evidence even to trained experience, the advent of a sure means of detection should be hailed with delight. About three years ago Dr. Robert Koch of Berlin discovered that the ptomains of the tubercular bacilli would, if injected in antiseptic solution, cause a rise of temperature in the case of tuberculous animals. This material known as tuberculin was at first considered a cure for the disease. It may yet become a cure, or, rather, something of this general nature may yet be worked out as a cure, though at present it is used only as a detector. In the case of tuberculous animals its injection is followed in from ten to sixteen hours by a rise of temperature of from two to six degrees or more, often accompanied with uneasiness and chills or rigors. The fever lasts from four to twelve hours. The amount of the increase in temperature does not necessarily indicate the extent of the disease. This means of diagnosis has been widely used within the past few years, and the percentage of failure to correctly determine the presence of the malady is exceedingly small. Post-mortems almost without exception confirm the test.

4. *Means of Reduction and Cure*—No known means of curing the disease are now recognized. In the human family change of climate and care in the selection of food may do much to cure incipient cases. It is believed, however, that in cattle the disease is incurable, that a cow once tuberculous is a hopeless case, a menance to the herdsmen, to the other cows in the herd, and to the consumers of the product, and an animal to be destroyed at once. In this country but little action has been taken along these lines. In England, Scotland, Germany, France, Switzerland and in Canada more or less pretention is made at dairy and meat inspection.

There is some slight meat inspection in this country, but, as yet, it would hardly detect tuberculosis in many of its forms. Denmark has a very thorough system of meat and dairy inspection. One of the largest milk supply stations in the world, located near Copenhagen, employs six veterinary surgeons, besides many local surgeons, whose sole business is the ferreting out and prevention of disease among the herds. They become very skillful in the detection of this disease in its incipient stages. The moment a cow shows enlarged glands above the udder, it is isolated. If future examination confirms this she is at once slaughtered.

The Bureau of Animal Industry at Washington is aiding in the control of bovine tuberculosis in this country, in preparing and sending tuberculin to the Experiment Stations and Cattle Commissions, that they may further test its reliability and determine the extent of the disease in cattle. We may hope for legislation in the near future looking toward the thorough inspection of our meat and dairy herds.

### Discussion—Tuberculosis.

Mr. Simpson—Will the souring of cream kill the tuberculous germs ?

Answer—No, it will not. They are quite as liable to be in sour cream butter as in sweet cream butter.

Mr. Simpson —Is there any way of treating the milk so as to render it harmless ?

Answer—Probably fifteen minutes boiling would do this.

Mr. Simpson—Are those animals showing the highest temperature after the injection of the tuberculin the most affected ?

Answer—Not necessarily. The extent of fever caused by injection of the tuberculin is not a measure of the stage of the disease.

Mr. Terrill—I understand that some of the cows in the Experiment Station herd are not tuberculous, although they have been exposed to it. May we consider these cows to be hereafter exempt from the disease.

Answer—So far as is now known there is no immunity from this disease, and these cows may later contract it.

Mr. Simpson—May we not hope that some day we can vaccinate animals for this and other diseases, the same as with small-pox ?

Answer—This is done in many diseases by using what is known as attenuated virus. Tuberculin was first advanced as a cure, and I believe that the cure of tuberculosis will in time be worked out along these lines. The injection of tuberculin in the human patient causes death of tuberculous tissue and sets up an inflammation about it.

Question—Can the farmer safely use tuberculin for diagnosis ?

Answer—I do not think it would be safe to trust it in any but skilled and trained hands.

## Steam Engines.

By A. W. Ayer, B. S., Professor of Mechanical Engineering, University of Vermont and State Agricultural College.

Two general classes met with in small plants: (a) Automatic fly-wheel governor; (b) Non-automatic, throttling governor. Former generally built for sizes above 15-horse power, and power of engine and its speed is regulated by the amount of steam admitted to the cylinder. In the non-automatic the same amount of steam is always admitted, and the speed is governed by regulating the pressure of the steam.

Oiling.—Use mineral oils exclusively. Pay at least 35 cents per gallon for oil for the bearings, and at least 60 cents per gallon for cylinder oil. Use just enough oil on bearings to have engine run without heating. Use for small engines about one drop cylinder oil in two minutes. It pays to have plenty of good cotton waste on hand, and don't be afraid to use it.

Packing.—Use Garlock or similar brand for piston-rods. Use asbestos wicking, soaked in oil and plumbago, for valve stems, etc. Plumbago (black lead) is first-class to apply to any kind of packing.

Steam.—The most economical pressure to use is from 60 to 80 pounds for small engines. Drain your steam pipe (by a one-fourth or three-eighth pipe) before opening the throttle. Leave cylinder cocks open only until cylinder gets hot.

Eccentric should generally be set ahead of the crank, a little more than one-fourth of the way around, or about 105° to 120° ahead of crank.

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## Vermont as a Dairy State.

By Hon. Victor I. Spear, Statistical Secretary State Board of Agriculture.

In adopting any business it is well to view the field in which we are to work. Therefore, let us consider the advantages and disadvantages attending us in Vermont dairying. There is a great difference between our best and our poorest cows. About one-third of the State reported to me the agricultural statistics requested. The average production per cow per year in one town was but 92 pounds of butter; in another, 259 pounds for the whole township. These differences are not to be accounted for by varying location, soil, etc., but are due to the different degrees of intelligence in the dairymen. Ryegate, the 259 pound per cow town, has no broad intervales or attractive surroundings, but is a hilly town of rather forbidding aspect. Their great success is due to investigation into the best methods, and to good animals, well fed and well cared for. This suggests great possibilities for the future in these lines. I see no reason why we should not strive for the best. There is something in Vermont conditions, in Vermont lands, pastures, grasses, waters, in the physical characteristics of the State, which aids in the production of the best dairy products. Our comparatively small dairy herds allow us to keep a more perfect control over our work. Our location is advantageous, close to the large markets. The product of one day may be on the table the next day, and our opportunities for the delivery of fresh goods are better than those of the western dairymen. We can supply the choice markets. Vermont has an established reputation for the best dairy goods, and it behooves us to work along these lines. It was thought years ago that fine butter could not be produced west of the Mississippi, but we now know that the Western States can make very cheaply a pretty good article; but, owing to

their distance, they are not as well able to place the choicest goods in our Eastern cities. I doubt if there is another locality as favorably situated as Vermont to supply just this line of material, in which manipulation and flavor are so important. It behooves us to strive to open every avenue for the utilization of dairy products. The production of the best in any line is never overdone. We may well fear competition from richer soils and broader fields, but we have an advantage which almost amounts to monopoly in the higher class of goods. If there are disadvantages in Vermont dairying they lie along the lines of (1) competition, (2) deteriorating pastures, (3) the fact that we have to supplement pasture feed most of the year, (4) the effort necessary to till Vermont land.

### Discussion—Vermont as a Dairy State.

Question—Where do you think the best cheese is made, in the hill towns or on the plains ?

Answer—I cannot say. The pastures of the hill towns, when not run out, are very often full of the sweetest and most nutritious grasses, making a foundation for good milk.

Question—Why is the southern portion of the State given over to cheese factories and the northern portion to creameries ?

Answer—I judge it is largely due to habit. The dairymen of the southern portion of the State have made cheese for many years. They have a class of cows adapted for that work.

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## Bacteriology.

By Dr. F. A. Rich, Instructor in Veterinary Science, Etc.

Bacteriology is receiving as much attention to-day as any science. It consists in the study of very minute living organisms, so small that the most costly microscopes are required to see them. These organisms have been known to exist for years, but, owing to the lack of facilities for their careful study, little advance was made until recent years. It was not even known to what kingdom they belonged until Cohn in 1860 determined them to be

of a vegetable nature. They had been studied principally by botanists who have made a fairly good classification. Within the last fifteen years, scientists have taken hold of the matter, instruments have been devised for this special work and great strides have been made in bacteriological knowledge. The difficulty of isolating the various species and cultivating them separately long stood in the way of advancement, but this has been overcome by Dr. Koch of Berlin, who ascertained what substances were most suitable for their food. He noticed that on the surface of sliced potatoes, standing in a moist, warm place, little dots appeared, gradually increasing in size until they finally coalesced, and he found by careful microscopical examination that these variously tinted little spots were colonies of bacteria, each generally consisting of a single species. Seeing the application of this to bacteriological research, he opened the way to all future investigators. He proceeded to free slices of potatoes of all bacteria by heating. They were then placed in little glass dishes which were previously sterilized by heating. Upon the surface of the sterile potato, with a clean platinum needle, he planted single species of bacteria, and, putting the dish in a warm place, he was thus able to grow a pure cultivation, which he could transfer to other dishes almost indefinitely without becoming mixed with other kinds of bacteria. He also devised a food, consisting of beef broth made solid when cold by the addition of pure gelatine, or, better, of a substance called agar, a species of sea-weed. This, added to beef broth, forms a solid, transparent food, not liquefied by any bacteria, and upon which they can be left to grow for months at a time.

We are constantly meeting with new varieties of bacteria. They are disseminated everywhere. Air, water and soil are teeming with them. Their presence is not accidental, but they are essential to the most common-place processes, among which we might mention the various forms of fermentation, putrefaction and decay of dead vegetable and animal bodies, brewing, dairying, nitrification of the soil and many others. They are also the cause of such diseases as tuberculosis, anthrax, hog cholera, chicken cholera, diphtheria, typhoid fever, lock-jaw, glanders, and many others; therefore the study of their activities, the laws governing their

development and the agents which will destroy them is one of utmost importance to all. They are destroyed by corrosive sublimate, 1 part to 1000 parts water; carbolic acid, 1 to 20 parts water; boiling water or steam, or dry heat (above 212 degrees). The direct rays of the sun will destroy nearly all bacteria and their spores in a few hours.

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## World's Fair Dairy Test.

Lecture by Mr. William Stuart, Assistant Chemist in the World's Fair Dairy Test. Instructor in Milk Testing, Vermont Dairy School.

One of the features of the Columbian Exposition was a competitive test of breeds of dairy cattle. Seven breeds were represented at the original committee meeting: Jerseys, Guernseys, Shorthorns, Ayrshires, Holsteins, Red Polls and Brown Swiss. The delegates of these associations of breeds formulated rules which met the approval of all. Notwithstanding, the first three breeds mentioned were the only ones which "showed up" in the test. The Ayrshire breeders claimed lack of funds as the reason for their withdrawal. The only reason that can reasonably be ascribed for the withdrawal of the others is lack of confidence in the merits of their respective breeds. The following rules governed the test:

1. Supervision of tests by a committee of seven, four being representatives of the Association of American Agricultural Colleges and Experiment Stations, and one representative from each of the competing breeds.
2. All associations should have cows in three tests, covering four and one-half months, and a heifer test, covering one month.
3. Selection of cows to be made by the associations.
4. Each association to be responsible for feed and care of cows.
5. Net profits to be basis of awards.
6. Food eaten to be charged at a fixed price set by the Department of Agriculture of the Fair.

7. No substitution of cows one for another.

8. No stimulant or drug allowed except by the authority of the official veterinarian.

9. Milking at stated times in presence of representatives of the committee.

10. Milk should be weighed and an aliquot part taken for analyses.

11. Sick cows dropped from the test under certain provisions.

12. Provisions in case of lost weights or samples.

These rules provided a simple and fair method of crediting to each cow her just dues. Four tests were provided, the first three being compulsory.

1. Cheese Test. Twenty-five cows; awards based upon value of cheese, whey, and change of live weight, less food cost. The milk from each breed was separately made into cheese, which was cured and rated by experts according to a fixed scale of price. Whey was valued at eight cents per hundred, live weight 4½ cents per pound, and cheese and whey apportioned among the individual cows according to the relation of total solids of the individual to that of the herd.

2. Ninety-day Butter Test. Twenty-five cows; awards based upon value of butter, of solids in the skim-milk and butter-milk, and change in live weight, less cost of food consumed. Solids not fat, two cents per pound, butter, etc., proportioned among cows according to relation between individual fat per cent. and herd fat per cent. Solids not fat were similarly calculated.

3. Thirty-day Butter Test. Fifteen cows; about three-fourths being those that had been in the twenty-five-day test and one-fourth fresh cows; awards based on butter alone, less cost of food. Herd superintendent had power to designate method of handling the milk from beginning to end.

4. Heifer Test. Animals not to be over three years old, awards under same conditions as Test 2, except that fat in milk was calculated to 80 per cent. butter at 40 cents per pound.

Each herd occupied a separate barn, under the general supervision of the superintendent. Cows were milked morning, noon and night. Strict supervision by the testing committee prevented

any fraud. The sampler took just one-fortieth of the total amount. Samples and the milk for the Dairy Building were kept under seal until used. Feed weights and records were made by the testing committee and representatives. Night and day guards were kept in each barn to prevent fraud in feeding or milking. At the Dairy Building seals were broken, covers removed from the cans, milk refrigerated, and in the morning that from each breed (three milkings mixed) was warmed in a vat, run through a DeLaval Separator and cream and skim-milk weighed. The former ripened from 24 to 48 hours was churned and printed. Samples of skim-milk, butter-milk and butter were analyzed, and weights of all butter and butter-milks taken.

At the laboratory each individual cow's milk was tested by lactometer and by Babcock, duplicates by different chemists, triplicates in case of variation of more than 0.20 per cent. Great precautions against error and fraud were taken. Gravimetric analyses were made of skim-milk, butter-milk and butter. It took four bookkeepers and two comptometers to handle the figures.

The results of the four tests are condensed in the accompanying table. The Jerseys were easy winners throughout, as will be seen by reference to the figures. In the cheese test they secured eight of the first nine places; in the ninety-day test twelve of the first thirteen; in the thirty-day test three of the first five. These tests cost the Exposition $63,000, the Jersey Cattle Club, $23,000, the Guernsey and Shorthorn Clubs from $5,000 to $10,000 apiece, and were the most prolonged, carefully conducted and conclusive dairy tests ever made.

| WORLD'S FAIR DAIRY TESTS. CHEESE TEST. | Lbs. Milk. | Lbs. Solids not Fat. | Lbs. Cheese | Lbs. Whey. | Gain Live Weight. |
|---|---|---|---|---|---|
| Jersey | 13296.4 | 1877.41 | 1451.76 | 11579 | 327 |
| Guernsey | 10938.6 | 1503.80 | 1130.62 | 9667 | 480 |
| Short Horn | 12186.9 | 1544.28 | 1077.60 | 10839 | 709 |

| | Price Cheese Per Lb. | Cheese Value. | Total Value Products. | Less Food. | Total Gain. | Lbs. Milk to 1 lb. Cheese. |
|---|---|---|---|---|---|---|
| Jersey | $0.1336 | $193.98 | $217.96 | $98.14 | $119.82 | 9.16 |
| Guernsey | 0.1195 | 135.22 | 164.55 | 76.25 | 88.30 | 9.67 |
| Short Horn | 0.1300 | 140.14 | 180.72 | 99.36 | 81.36 | 11.31 |

| 90 DAY BUTTER TEST. | Credits Total Products. | Debits Totals. | Net Gain. | Lbs. Milk to 1 lb. Butter. |
|---|---|---|---|---|
| Jersey | $1911.591 | $587.779 | $1323.812 | 17.195 |
| Guernsey | 1481.889 | 484.250 | 997.639 | 18.381 |
| Short Horn | 1412.924 | 502.807 | 910.117 | 22.922 |

| 30 DAY BUTTER TEST. | Lbs. Milk. | Lbs. Fat. | Lbs. Butter, 80 % Fat. | Value Butter. | Cost Feed. | Net Gain. | Lbs. Milk to 1 Lb. Butter. |
|---|---|---|---|---|---|---|---|
| Jersey | 13921.9 | 685.81 | 857.211 | $385.592 | $111.243 | $274.127 | 16.6 |
| Guernsey | 13518.4 | 597.96 | 724.170 | 329.768 | 92.766 | 237.002 | 18.6 |
| Short Horn | 15618.3 | 555.43 | 662.660 | 303.685 | 104.551 | 198.891 | 23.0 |

## World's Fair Butter Exhibit.

Lecture by Hon. H. M. Arms, Vermont Dairy Commissioner to Columbian Exposition, Member State Board of Agriculture.

Let us first and mainly consider the Vermont exhibits. I think we may justly claim that the dairy industry of this State leads the world, although it may be questionable if the creamery interests are quite so far ahead ; but they are not far from the front. Vermont was at a disadvantage compared to other states in the matter of distance. Some states could offer goods but two days old for judgment, while Vermont goods were invariably from fifteen to twenty days old. There has been as yet no official report, but the commissioners of all the states received the scores of all, and all

these commissioners concede, as does also John Boyd Thatcher, the head of Awards Committee at the Fair, that Vermont led. All the states exhibiting showed fine goods. The far western states made astonishing exhibits. Nebraska butter, in particular, like wine and violins, improves with age. I think it due to their hard, solid, nutritious and not very succulent grass. Her exhibit was all creamery goods. Vermont's exhibit was from all over the State, and every package sent competed, none being rejected. Many commissioners threw out poor goods, while Vermont's high ratings represented everything sent. This result I believe to be mainly due to the superior intelligence of the Vermont dairymen, and the extra quality of Vermont grass. Out of the eight highest scores of September and October, four came from Vermont. In June Vermont exhibited twenty-two samples, the entire country one thousand. Her average butter scores were above those of any other states, and were never before reached by any other. In July the respective exhibits were twenty-six and eight hundred. There was no perfect butter in this exhibit, but Vermont had two samples scoring above those of any other state. The same was the case in September, and in October, when extra precaution was taken that no judge should know the source of any sample, the same result was obtained. The St. Albans Creamery got more awards than any other, and a higher average for four exhibits than any creamery in the country.

We should not, however, be contented with this success, but strive to be yet more successful along these special lines of butter dairying. One of the aids to the dairy interest in all states is the proposed formation of a National Dairy Association, the main object of which is to fight oleo on the sole ground of its being a fraud. This organization should be in touch with the national department of agriculture and be powerful for good to compel this comparatively indigestible product to sell upon its own merits.

### Discussion—World's Fair Butter Exhibits.

Question—Was the cold storage in the Dairy Building at Chicago a success ?

Answer—It was a failure. The pipes taking the chilled brine

were at the bottom of the cases, and any child knows that cold air is heavy and sinks, and hot air is light and rises; but the contractors did not seem to know it. The natural result was that the bottom of the case was cold and the top very warm ?

Question—Were the Vermont butters from the same person during different months of uniform excellence.

Answer—Sometimes they were, sometimes they were not. I have a case in mind of a celebrated butter maker in this State whose scores ran as follows: June 99, July 95, September 88, October 82. The cause of this rapid fall, which was mainly in flavor, was found after much searching to lie in a pool of water to which the cows found access, which was growing from bad to worse as the season went on.

Mr. Day—If, as is stated, flavor is so extremely essential a point in butter, ought it not to have a higher rating than 45, as in the Chicago score ?

Answer—Flavor is much, but is not all. If it were rated 60, 70 or 80 it would necessitate too fine a division on the minor points.

Mr. Davis—What was the highest score at Chicago ?

Answer—One hundred.

Mr. Terrill—Why did Canadian cheese score so well, and Canadian butter so poorly ?

Answer—From the beginning of the world the Canadians have been making cheese. They have been making an export cheese, and have put much intelligence and dairy knowledge into it. Their dairy educational system is first-class, and some of its effects may be seen when we consider the 126 prizes out of 134 which went to Canada on the cheese. Butter making, however, is comparatively recent with them, and they have not paid much attention to it.

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## Boilers.

Lecture by A. W. Ayer, Professor of Mechanical Engineering, University of Vermont and State Agricultural College.

Usual material now is mild steel. The three most common types: Horizontal tubular, upright and locomotive. The order of preference of these types is :

For space required—upright, locomotive, horizontal.

For first cost, with setting—same as for space required.

For economy—horizontal, locomotive, upright.

*Feeding*—Keep water level within half a gauge of middle gauge cock. Cheapest way to feed is by a belt pump, working the pump all the time engine is running. The next best is by an injector, and this is cheapest in first cost. Feed little at a time, and often if you cannot feed continually.

*Firing*—Avoid extremes in the condition of the fire. Fire a little and often for maximum economy.

*Safety Devices*—Safety valves should be attached directly to boiler, and should be opened at least once a week, if not blown open in that time, to avoid sticking.

Insure your boiler, which gives you a thorough inspection yearly by competent person.

In case of water becoming dangerously low, draw or bank your fire, and do not feed in any water until pressure has fallen to a few pounds.

*Incrustation and Scale*—Deposits usually formed when water enters boiler.

Don't believe the man who has a boiler compound which is guaranteed a cure for every kind of bad water. Only sure way to know what to introduce to counteract the impurities is to have the water analyzed. If you use a boiler compound, blow off a gauge of water every morning before starting fire. The only safe compounds act chemically. Never use one which acts mechanically by detaching large pieces of scale which may fall on the boiler shell directly over the fire. Never allow oil to be put in your boiler. The water of large lakes and river is better than that of springs and small streams for your boiler.

## VERMONT PASTURES.

By Prof. L. R. Jones, Professor of Botany, U. V. M. and S. A. C., and Botanist of Experiment Station.

Four-fifths of the cleared land of Vermont grows grass. Vermont is peculiarly adapted to growth of grass, because of the even

distribution of rain fall. Grasses form a distinct family of plants, which include pasture and meadow grasses, corn, oats and other grains. Clover is a member of the pea family. The so-called "marsh" or "swale-grasses" are not grasses but sedges, having leaves in three ranks. Grass leaves are two-ranked, stems jointed, generally hollow except at joints, and from each joint arises a single leaf. Leaf grows from base, hence valuable as pasture plants. Grasses are annual or perennial. There are in Vermont 115 different species of grass, each with peculiar valuable characters and modes of growth, many different species on every farm. English grass mixtures are not good for Vermont. We must make our own mixtures from our hardier grasses, and must first learn to know these grasses, both by sight and by name. Botanical names are necessary because of confusion of common names. Grasses all should know are: Timothy, June, Orchard, Red top, Rhode Island bent, Fowl meadow, Meadow fescue, Flat-stemmed pea, Quack, Whitetop, Barnyard and Pigeon grasses.

Books valuable for distinguishing grasses are: Flint's "Grasses and Forage Crops," Beal's "Grasses of North America," McAlpine's "How to know Grasses by their Leaves." The Experiment Station will gladly identify grasses. Let each one learn to recognize them.

Timothy is the best grass for Vermont, but we should use more Orchard, Red top, Rhode Island bent, June grass and Fowl meadow, each in its proper place; Orchard grass for shady places, June grass, Rhode Island bent for pastures, Red top and Fowl meadow for meadows too wet for Timothy. Grass seed best adapted for Vermont cannot be raised in Kentucky or Iowa. We should go north, not south, for seeds.

Other cultivated plants have many varieties, e. g. Corn. Why not grass? Vermont pastures are deteriorating since the change from sheep to cows. What shall we do? First, allow portions to grow up to forest; second, use some other kind of stock on portions, as sheep, geese; third, fertilize the better portions, preferably by top dressing. Never plow unless necessary. The best kind of pasture grasses are already present in our pastures. We should fertilize them, clean out bushes and give them a fair chance.

## REPAIRS.

Lecture by MR. G. E. HUMPHREY, of the St. Albans Creamery.

The creamery man, like the merchant, must aim to please his patrons, and I believe the man who has charge of the separator has a harder place to fill than he who stands behind the counter, and I have been in both places.

I would advise early rising, and early and efficient steam pressure, quick, neat, active and accurate movements, kindness but firmness. One of the places where firmness is needed is in the delivery of the skim-milk. At H. C. Gleason's factories the skim-milk is caught directly into the cans, and we have never had trouble. The Franklin County Association have two sticks, one graduated to full inches, the other to measurements as much short of an inch as is the proportion between the whole milk and skim-milk weights.

In running the boiler be careful not to trust too much to the water guage. Blow it off every day. In taking care of the engine be sure you know where to make changes, tightening or otherwise, before you go to work. Cylinder oil is excellent for hot-boxes. It is well sometimes to mix sulphur with it. It is sometimes questionable in case of hot-box what to do, whether it is better to put on oil or stop the machine. In case the spindle is set, if it be black and discolored, smooth down with emery paper and pumice stone. The web painted belt is perhaps as good a separator belt as any. In churning it is better to have the belt go around the churn than around the pulley upon the end of it. It is not so apt to break the pulley. A hard wood churn is better than a soft wood churn, and cleans better.

## ANTHRAX.

Lecture by Dr. F. A. RICH, Instructor in Veterinary Science, Etc.

This disease affects all domestic animals, except the flesh-eaters, such as dogs. Man is susceptible to it, and sheep, horned cattle

and horses are all liable to contract it. The result depends upon the portions of the body infected. If the poison enters the digestive canal, death usually ensues. If, in man, a wound is poisoned, carbuncles form, killing perhaps one in five.

The cause of the disease is a bacterium, which under the microscope looks like a lead pencil, measuring $\frac{1}{5000}$ of an inch long. Its spores withstand both heat and cold and may live for years in a dry place, when heat, moisture and food cause them to germinate and develop the disease. Animals are usually taken very suddenly. If milch cows, the flow ceases at once, the hind quarters become paralyzed, and the cow usually dies in great pain, sometimes within two or three hours, and usually within forty-eight hours. When farm stock thus dies a competent veterinarian should be called at once to investigate, the carcass should be burned as soon as possible, without opening, or, be buried under not less than six feet of earth, care being taken to bury the soil on which the dying cow laid, as well as all blood, etc.

The disease works so rapidly, and often goes through a herd with such speed that remedial measures can hardly be used. The following methods of checking, however, may be instanced:

1. Avoid manures from questionable sources, and shun materials which may carry this disease, as imported wools, skins, rags, etc.

2. Insist upon the proper disposal of suspected carcasses, either by cremation or deep burial.

3. In the near future it is believed by means of attenuated virus this disease may be brought under control.

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## Building up a Dairy Herd.

By Hon. G. S. Fassett, Trustee University of Vermont and State Agricultural College, Member Experiment Station Board of Control.

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The fields of Vermont are not as broad or as easily cultivated as those of some other states, but our crops have not so many enemies, nor our industries so many collapses. We are dairymen by

the law of adaption, but in our calling, as in others, to keep the upper story we must climb.

Pardon me if I give a brief history of my own experience, since I am talking in a familiar way as we would about our firesides. When I began life for myself I bought a 126-acre farm, paying a high price for it. I soon found it would not carry twenty cows, prices fell, I could pay only the interest. I sat down and thought. I had a fairly good herd of grade Durhams, grade Ayrshires and natives, making 150 pounds per cow per year. Butter was sold in a general market. I then aimed to improve my herd by testing, weeding, breeding and better care, without putting too much money into it, working for a 200 pound butter cow, a better market and more home grown fodder. It costs $30 to keep the average cow. One hundred and fifty pounds of butter at 20 cents just covers the keeping, but 200, 250 or 300 times 20 cents gives profit, and usually with such increases the keeping capacity of the farm and butter prices go up. I began testing my cows by test tubes and by churning. These showed great differences in my cows. I bought a thoroughbred Jersey bull calf and began to grade up toward a 200 pound dairy. Fearing that the offspring of this cross might take back to bad ancestry on the mother's side, I bought a few high grade Jersey heifers, costing about $60 apiece. When they came in they made nine pounds of butter or more apiece as two-years-olds. They all showed evidences of good breeding, for a specific purpose. Along these lines I built up a 300-pound herd from a 150-pound herd without much additional cost of keeping.

Good breeding, gentle handling, protection, good air and exercise, are essential, with steady but not too rapid growth until matured. Avoid cows making large amounts of butter from enormous quantities of food, as well as the large eaters that make small amounts. As in other lines of business, to be successful the butter must bring more than the cost of producing. I believe in using a thoroughbred bull, in avoiding in-breeding (because it tends to weaken constitution), in avoiding strong out-crosses, in aiming at something definite, in making use of the dairy points as laid down by cattle associations, of the test and of the scales,

using care, precision and definite aim. You need not then fear failure.

### Discussion—Building up a Dairy Herd.

Question—Can a man afford to feed a cow good timothy hay ?

Answer—I think so, if situated as I am. If I were near Burlington, with hay at $14 a ton, it would be doubtful economy, but it is not worth $10 a ton at my barn.

Question—What grains do you feed ?

Answer—Cottonseed meal and bran usually. Last year I used gluten, bran free of flour and ground oats. Mine being a summer dairy, I depend upon grass mostly, my grasses being mainly timothy with not much clover.

Question—In what proportion do you mix your grains ?

Answer—Two pounds bran and one pound cottonseed.

Question—Do you think it profitable to feed so largely of hay, or to mix in the oat straw ?

Answer—I do not feed straw until the cows are dry. I calculate to have the straw eaten up by the time they come in. My farm has but little grain land upon it, but it raises fine crops of grass.

Question—How do you feed your calves ?

Answer—New milk for ten days, and then gradually work them on to skim-milk. We keep the calves up the first year, and never feed grain during the summer, giving them grain, however, during the first winter.

Question—Do you feed any roots ?

Answer—Not very many.

Question—What system of handling milk do you use ?

Answer—The old-fashioned shallow pan. I market in twenty-pound tubs to private customers.

Question—When do you cut your hay ?

Answer—The last of June to the 1st of August. I seed quite heavily with clover, and get more or less of a second growth.

Question—What are the records of your cows ?

Answer—I have no individual cow records and have never used the Babcock on them. I used to test a good deal in earlier days,

but believe that I now have them in such good condition that I do not need the test so much as some others. We determine the average butter product of our herd by dividing the pounds sold by the average number of cows in milk. The herd gives now from 250 to 300 pounds per year per head. I am inclined to think that the limit of the best profit is 300 pounds per head. If we go above that we take risks which more than balance the gain.

Question—Are your cows registered ?

Answer—I have never had but one registered. My cows are almost all high grades, ranging from 15-16 to 127-128. When they get closer than that I forget about it. I believe my high grades are better than most registered stock. My cows repeat themselves in their calves, whereas many registered cows are apt to have "sports."

Question—Do you believe in the use of a registered bull ?

Answer—You may plant seeds from the Baldwin apple and the product will seldom if ever be a Baldwin. This is because the flower is fertilized by the bee with the pollen of scrub blossoms all around. You can never be sure of what you will get in planting an apple seed. In the same way, if one uses a scrub bull one can never feel sure of the progeny, and the bull is half the herd.

Question—Do you believe in in-breeding ?

Answer—For the first cross it is apt to work well, but if persisted in is liable to produce deformity and weakness. I cannot recommend it.

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BLANK FORM USED BY DAIRY SCHOOL STUDENTS IN KEEPING RECORDS OF THEIR WORK.

DATE NAME

SEPARATING.

Pounds of whole milk, Skim milk, Cream,
Pounds of bowl slop, Water used, Loss or gain,
Separator used, Speed, (1) (2) (3)
Milk per hour, lbs. Timing, (1) ×60— (2) ×60— (3) ×60—
Entire run, + minutes ×60—
Ratio cream and skimmilk : Cream— : skim— :: 1 :
Per cent. of cream Milk— : cream— :: 100 : , Per cent. Increase —
Time of running machines, minutes

## CHURNING.

Cream ripened, hours, at °F., from milk of separated by
Condition of cream, Acidity of cream, C.C. $\frac{N}{10}$ alkali used
Starter used, Starter, how made,
Churn used, Temperature churning, beginning, end,
Time churning, minutes, How salted Amount salt used to lb.
Granular butter, lbs., Salted butter, lbs., Printed butter, lbs.,
Butter worker used, Revolutions and time,

## TESTING.

Number pint samples taken W. M. S. M. B. M. B. S.
Weight butter sample,

| Pounds. | My Test. Per cent. Fat, | Average Test. Per cent. Fat, | Pounds of Fat, | Per cent. of Total Fat. |
|---|---|---|---|---|
| Whole milk, | | | | 100 |
| Skim milk, | | | | |
| Bowl slop, | | | | |
| Buttermilk, | | | | |
| Butter, | | | | |
| Mechanical losses, | | | | |

Remarks :

## TESTS OF DAIRY APPARATUS.

(Extracted from Seventh Annual Report of Vermont Agricultural Experiment Station.)

The third session of the Dairy School of the University of Vermont and State Agricultural College was held at Burlington from January 7th to February 10th, 1894. A considerable amount of data was obtained by the Experiment Station officers during the course of the school upon the following points:

1. Relative efficiency of different makes of separators.
2. Power consumed by different makes of separators.
3. Character and amount of losses in the creamery processes, including mechanical losses.
4. Details of churning.

The school was equipped with the best apparatus obtainable. Butter workers, aerators and churns were the same as were used in the previous years. There were twelve separators in use, seven power and five hand.

| Separator. | Kind. | Manufacturers or Agents. | Rated capacity per hour. |
|---|---|---|---|
| Columbia | P.* | Columbian Cream Separator Co., Avon, N.Y. | 300 |
| Danish | P. | A. H. Reid, 30th and Market Sts., Phil., Pa. | 2000 |
| Alpha Acme, Belt | P. | DeLaval Separator Co., 74 Cortland St., N.Y. | 1000 |
| Alpha Turbine | P. | " " " " | 2000 |
| Baby Alpha, No. 2 | H.* | " " " " | 300 |
| Baby Alpha, No. 3 | H. | " " " " | 600 |
| Jumbo | P. | Davis & Rankin, Chicago | 2000 |
| Russian Steam | P. | P. N. Sharples, West Chester, Pa. | 1200 |
| United States | P. | Vermont Farm Machine Co., Bellows Falls, Vt. | 2000 |
| " No. 3 | H. | " " " " | 300 |
| " No. 5 | H. | " " " " | 600 |
| Victoria | H. | Moseley & Stoddard Mfg. Co., Rutland, Vt. | 360 |

*P—power. H—hand.

The above machines, with the exception of the Jumbo, were kindly loaned us by the manufacturers or their agents. The University is much indebted to these parties for their kindness.

The machines were generally run in the presence of and sometimes with the help of agents of the different companies, and it is fair to suppose that they were run at their best. The power machines were set on a stone pier and run by a 12-horse power engine.

The general method of procedure during the Dairy School was as follows:

The milk (1000 pounds) came in by team at about half-past eight o'clock in the morning. This was poured into a milk vat and warmed to the temperature desired. Usually but one separator was used daily, the whole thousand pounds being run through the one machine, and the cream churned by itself, so that the record shows the work and the results from each machine separately. On some days, however, two or more machines were used in order that visitors might view the difierent separators in operation. This renders a small portion of the records somewhat fragmentary.

The cream was caught in cans, run over the cooler, which both aerated it and brought it to any desired temperature. It was then set in the cream vat sometimes with and sometimes without a starter, usually held for twenty-four hours, with frequent stirring, churned,washed in the granular form, salted on the worker an ounce to the pound, worked thoroughly and printed at once.

Samples and weights of whole milk, skim-milk, separator bowl slop, butter-milk and butter were taken every day throughout the test. Generally four samples of each whole milk, from four to ten of skim-milk, two of butter-milk, and always two of butter, were taken and all analyzed.

Thus we have the figures for calculating the amount of fat originally present in the milk, the amounts lost in the skim-milk, bowl slop and butter-milk, the amount recovered in the butter, and that lost mechanically.

Tables I and II give the most important facts concerning the handling of the milk and cream.

It will be noted that there is considerable difference in the capacity of the various machines in the amount of milk they can skim per hour, and the average figures for each will be found under the test of each machine.

The horse power used by the belt separators and by some of the hand machines was measured by means of the Emerson Power scale, a transmission dynamometer manufactured by the Emerson Power Scale Co., of Florence, Mass.

| Date of Separation. | I. SEPARATOR. | Revolutions per minute. | Pounds of Milk per hour. | Temperature of Milk. | Ratio, Cream to Milk. | Per cent. of Milk taken as Cream. | Per cent. of Fat in | | | | | Horse Power used. | Horse Power used per 1000 lbs. Milk per hour. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Whole Milk. | Skim Milk. | Bowl Slop. | Butter Milk. | Butter. | | |
| 8 | DeLaval Alpha | 5,900 | 1,692 | 86 | 6.7 | 12.5 | 4.35 | 0.05 | 0.20 | 0.20 | 84.10 | | |
| 11 | Turbine | 5,700 | 1,780 | 85 | 4.8 | 17.2 | 4.40 | 0.06 | 0.10 | 0.10 | 82.39 | | |
| 15 | | 5,930 | 1,818 | 86 | 6. | 14.2 | 4.30 | 0.07 | 0.35 | 0.45 | 81.14 | | |
| 18 | | 5,600 | 1,919 | 83 | 5.8 | 14.2 | 4.34 | 0.07 | 0.30 | 0.18 | 81.74 | | |
| | Average | 5,780 | 1,800 | 85 | 5.8 | 14.4 | 4.35 | 0.06 | 0.24 | 0.23 | 82.34 | | |
| 11 | Jumbo | 6,800 | 1,930 | 85 | 4.6 | 17.8 | 4.40 | 0.17 | 0.10 | 0.10 | 82.39 | | |
| 20 | | 7,090 | 1,788 | 83 | 6.3 | 13.6 | 4.21 | 0.21 | 0.14 | 0.30 | 80.76 | | |
| 3 | | 7,033 | 1,823 | 83 | 5.8 | 14.2 | 4.22 | 0.22 | 0.15 | 0.15 | 79.82 | 3.34 | 1.84 |
| 6 | | 6,870 | 1,740 | 80 | 5. | 16.2 | 4.27 | 0.25 | 0.13 | 0.10 | 80.82 | 3.31 | 1.90 |
| | Average | 6,925 | 1,820 | 83 | 5.4 | 15.5 | 4.27 | 0.21 | 0.13 | 0.16 | 80.95 | 3.33 | 1.87 |
| 10 | DeLaval Alpha | 5,400 | 1,088 | 83 | 5. | 17.1 | 4.45 | 0.05 | 0.20 | 0.24 | 83.00 | | |
| 13 | Acme Belt | 5,400 | 1,122 | 83 | 5.3 | 15.9 | 4.52 | 0.05 | 2.10 | 0.25 | 80.83 | | |
| 22 | | 5,800 | 1,023 | 80 | 8.7 | 10.2 | 4.31 | 0.10 | 2.10 | 0.20 | 82.33 | | |
| 2 | | 5,600 | 1,190 | 83 | 8.3 | 11. | 4.17 | 0.14 | 2.20 | 0.11 | 82.64 | 0.94 | 0.79 |
| | Average | 5,550 | 1,106 | 82 | 6.7 | 13.6 | 4.36 | 0.09 | 1.65 | 0.20 | 82.20 | 0.94 | 0.79 |
| 24 | Reid's Improved | 5,700 | 2,035 | 84 | 6. | 13.3 | 4.26 | 0.20 | 0.05 | 0.17 | 81.70 | | |
| 27 | Danish | 5,667 | 2,020 | 84 | 5.3 | 14.7 | 4.27 | 0.18 | 0.11 | 0.10 | 80.80 | 3.53 | 1.75 |
| 29 | | 5,867 | 2,130 | 82 | 5.5 | 14.3 | 4.22 | 0.21 | 0.08 | 0.10 | 83.06 | 3.55 | 1.67 |
| 5 | | 5,400 | 2,020 | 80 | 5.5 | 14.4 | 4.23 | 0.08 | 0.05 | 0.09 | 85.82 | 4.10 | 2.03 |
| 7 | | 5,733 | 2,187 | 81 | 5.1 | 15.4 | 4.21 | 0.17 | 0.10 | 0.10 | 80.51 | 4.04 | 1.86 |
| | Average | 5,673 | 2,078 | 82 | 5.5 | 14.4 | 4.24 | 0.17 | 0.08 | 0.11 | 82.38 | 3.81 | 1.83 |
| 30 | *United States No. 1 | 7,000 | 1,945 | 82 | 6.6 | 12.7 | 4.28 | 0.08 | 0.10 | 0.12 | 81.60 | 2.79 | 1.43 |
| 31 | | 7,067 | 1,962 | 83 | 6.4 | 13. | 4.32 | 0.15 | 0.12 | 0.11 | 81.93 | 2.64 | 1.35 |
| 1 | | 7,000 | 1,826 | 82 | 6.8 | 12.5 | 3.95 | 0.27 | 0.11 | 0.10 | 81.50 | 2.40 | 1.32 |
| | Average | 7,022 | 1,911 | 82 | 6.6 | 12.7 | 4.18 | 0.17 | 0.11 | 0.11 | 81.68 | 2.61 | 1.37 |
| 9 | Russian Steam | 7,033 | 1,403 | 81 | 5.7 | 14.3 | 4.03 | 0.17 | 0.08 | 0.20 | 83.07 | | |
| 10 | | 7,100 | 1,228 | 83 | 6.2 | 13.2 | 4.30 | 0.17 | 0.37 | | | | |
| | Average | 7,066 | 1,315 | 82 | 5.9 | 13.8 | 4.17 | 0.17 | 0.23 | | | | |
| 12 | United States No. 3 | 7,500 | 623 | 83 | 4.2 | 19.3 | 4.45 | 0.05 | 0.20 | 0.24 | 83.08 | | |
| 19 | | 7,250 | 574 | 83 | 3.5 | 22. | 4.28 | 0.08 | 0.10 | 0.38 | 81.50 | | |
| 28 | | 7,266 | 606 | | 6.1 | 14.1 | 4.24 | 0.12 | 0 15 | 0.22 | 82.02 | 0.36 | 0.61 |
| | Average | 7,330 | 600 | 83 | 4.6 | 18.3 | 4.31 | 0.08 | 0.48 | 0.28 | 82.20 | 0.36 | 0.61 |
| 10 | Columbia | 7,200 | 300 | 83 | 1.7 | 30.7 | 4.45 | 0.05 | 0.20 | 0.24 | 83.00 | | |
| 13 | | 7,200 | 270 | 83 | 3. | 24.6 | 4.52 | 0.05 | 0.10 | 0.25 | 80.83 | | |
| | Average | 7,200 | 285 | 83 | 2.4 | 31.2 | 4.49 | 0.05 | 0.15 | | | | |
| 12 | DeLaval Baby No. 2 | | 282 | 83 | 5. | 16.5 | 4.28 | 0.04 | 0.45 | 0.38 | 81.50 | | |
| 19 | " " No. 3 | 6,000 | 585 | | 8.5 | 9.6 | 4.20 | 0.23 | 1.71 | 0.24 | 82.09 | | |
| 19 | Victoria | 6,000 | 366 | | 7.9 | 11.1 | 4.20 | 0.38 | lost | 0.24 | 82.09 | | |

***Manufacturers claim that through an oversight this machine was sent new and untried from the factory; that an imperfection was found in its mechanism, and that it does not airly represent their output.**

## II.

### Separator.

| Date of Separation. | | Acidity of cream in c. c. $\frac{N}{10}$ alkali | Temperature at beginning of Churning. | Temperature at end of Churning. | Time of Churning in Minutes. | Weight of Salted Butter. | Per cent. of the total Fat in | | | Theoretical per cent. of Butter Fat recovered. | Actual per cent. of Butter Fat recovered. | Per cent. of mechanical loss. | Theoretical pounds of 80% Butter made per 100 lbs. Fat. | Actual pounds of 80% Butter made per 100 lbs. Fat. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Skim-milk. | Bowl Slop. | Butter-milk. | | | | | |
| 8 | DeLaval Alpha .... | 20 | .... | .. | .. | .... | 1.0 | .. | .. | .... | .... | .... | .... | .... |
| 11 | Turbine..... | 30 | 48 | 51 | 27 | 44. | 1.5 | 0.1 | 0.2 | 98.2 | 83.3 | 14.9 | 122.8 | 140·1 |
| 15 | .... ..... .. | 30 | 49 | 58 | 42 | 49.3 | 1.4 | 0.1 | 0.1 | 97.6 | 92.6 | 5. | 122. | 115.8 |
| 18 | ..... .... ..... | 30 | 50 | 60 | 78 | 49. | 1.3 | 0.1 | 0.4 | 98.2 | 91.9 | 6.3 | 122.8 | 114.4 |
| | Average.... ..... | 28 | 49 | 56 | 49 | .... | 1.3 | 0.1 | 0.6 | 98. | 89.3 | 8.7 | 122.5 | 111.6 |
| 11 | Jumbo.... ..... | 30 | 48 | 51 | 27 | 44. | 1.5 | 0.1 | 0.2 | 98.2 | 83.3 | 14.9 | 122.8 | 104.1 |
| 20 | .... ..... ..... | 28 | 48 | 52 | 23 | 48. | 4.3 | 0.1 | 0.7 | 95. | 91.3 | 3.7 | 118.8 | 114.1 |
| 3 | ..... ..... .. | 35 | 47 | 52 | 25 | .... | 4.3 | 0.1 | 0.3 | 95.3 | .... | .. | 119.1 | .... |
| 6 | .... ..... ..... | 36 | 45 | 47 | 28 | 47.7 | 4.7 | 0.1 | 0.3 | 95 | 92.6 | 2.4 | 118.8 | 115.8 |
| | Average.... ..... | 32 | 47 | 51 | 26 | .... | 3.7 | 0.1 | 0.4 | 95.9 | .... | .... | 119.1 | .... |
| 10 | DeLaval Alpha..... | 38 | 54 | 58 | 25 | .... | 1.0 | 0.1 | 0.9 | 98. | .... | .... | 122.5 | .... |
| 13 | Acme Belt..... | 26 | 54 | 59 | 25 | 45. | 0.9 | 0.3 | 0.8 | 98.1 | 87.3 | 10.8 | 122.6 | 109.1 |
| 22 | ..... .. ..... .. | 28 | 47 | 52 | 32 | 48. | 2.1 | 0.2 | 0.3 | 97.4 | 91. | 6.4 | 121.8 | 113.8 |
| 2 | .... ..... ..... | 35 | 46 | 52 | 50 | 47.2 | 2.9 | 0.2 | 0.3 | 96.7 | 92.1 | 4.6 | 120.9 | 115.1 |
| | Average.... .... | 32 | 50 | 55 | 33 | .... | 1.7 | 0.2 | 0.6 | 97.4 | 90.1 | 7.3 | 121.8 | 112.7 |
| 24 | Reid's Improved... | 36 | 48 | 52 | 28 | 48. | 3.7 | 0.1 | 0.5 | 95.7 | 91.7 | 4.1 | 119.8 | 114.6 |
| 27 | Danish.... ..... | 36 | 46 | 53 | 30 | 50. | 3.2 | 0.1 | 0.2 | 96 6 | 92.8 | 3.8 | 120.8 | 116. |
| 29 | .... ..... .. | 30 | 48 | 52 | 16 | 46. | 4.0 | 0.1 | 0.2 | 95.8 | 91. | 4.8 | 119.8 | 115.8 |
| 5 | .... .... .... ..... | 40 | 46 | 49 | 15 | 48.2 | 1.5 | 0.1 | 0.2 | 98.2 | 98. | 0.2 | 122.8 | 122.5 |
| 7 | .... ..... .... | 38 | 44 | 50 | 36 | 46.5 | 3.2 | 0.1 | 0.2 | 96.6 | 89.6 | 7.0 | 120.8 | 112. |
| | Average..... .... | 36 | 46 | 51 | 25 | 47.8 | 3.1 | 0.1 | 0.3 | 96.6 | 92.6 | 4.0 | 120.8 | 115.8 |
| 30 | United States No. 1 | 33 | 47 | 52 | 35 | 47.8 | 1.5 | 0.1 | 0.3 | 98.1 | 92.6 | 5.5 | 122.6 | 115.8 |
| 31 | ..... .... ..... | 35 | 47 | 52 | 26 | 49. | 3.0 | 0.1 | 0.3 | 96.4 | 92.5 | 3.9 | 120.5 | 115.6 |
| 1 | .... ..... .. | 37 | 47 | 52 | 28 | 45.3 | 5.8 | 0.1 | 0.2 | 93.5 | 92.4 | 1.1 | 116.9 | 115.4 |
| | Average.... ..... | 35 | 47 | 52 | 30 | .... | 3.5 | 0.1 | 0.3 | 96.1 | 92.8 | 3.2 | 119.3 | 116. |
| 9 | Russian Steam..... | 20 | 45 | 52 | 56 | 45. | 3.4 | 0.1 | 0.5 | 96. | 91.9 | 4.1 | 119.2 | 114.4 |
| 10 | ..... ..... .. | .. | .... | .... | .... | .... | 3.4 | 0.1 | .. | .... | .... | .... | .... | .... |
| | Average .... .... | .. | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| 10 | United States No. 3 | 38 | 54 | 58 | 25 | .... | 1.0 | 0.1 | 0.9 | .... | .... | .... | .... | .... |
| 12 | .... ..... .. | 37 | 47 | 56 | 60 | .... | 1.1 | .. | 1.3 | .... | 94.6 | 3.3 | .... | .... |
| 8 | ..... .... ..... | 42 | 44 | 52 | 52 | 47.1 | 2.4 | 0.1 | 0.6 | 96.9 | 90.2 | 6.7 | 121.2 | 112.8 |
| | Average .... .... | .. | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| 10 | Columbia .... ..... | 38 | 54 | 58 | 25 | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| 13 | .... ..... ..... | 26 | 54 | 59 | 25 | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| | Average .... .... | .. | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| 12 | DeLaval Baby No. 2 | 37 | 47 | 56 | 60 | .... | .... | .... | .... | .... | .... | .... | .... | .... |

# REPORT OF THE BOARD OF AGRICULTURE ACTING AS CATTLE COMMISSIONERS.

To his Excellency the Governor, to the Honorable Senate and House of Representatives:

The Board of Agriculture, acting in the capacity of Cattle Commissioners, beg to present the following report of their work since December 1, 1892:

The Legislature in its acts of 1892 abolished the Cattle Commission and transferred its duties to the Board of Agriculture.

This was done for the sake of economy, in service and traveling expenses; the Board being scattered over the State and during a portion of the year being already under pay from the State.

As a matter of economy, it has proved a success and in ordinary times it might be a wise move for various reasons, and the Board for the past two years have, as we believe, managed the work of the Cattle Commission so as to save considerable to the State treasury, and give general satisfaction to the public without exciting hostility to the Board of Agriculture. It was an experiment, and, we believe, has been one accompanied with a good deal of risk to the effective working of the Board in its legitimate field of giving agricultural instruction to the public. In order to reach the general farming public there should be a bond of friendly confidence between the public and the Board. They should feel that the Board of Agriculture go into their midst as friends and advisers. There should be no part of the Board work of such a nature as to antagonize any portion of the community. The natural work of the Board is friendly, instructive, and of a somewhat social nature, while the work of the Cattle Commission is often compulsory, and of the nature of legal force in executing a necessary and arbitrary law.

The work of the two branches is so directly opposite in its nature as not to harmonize. The new work that is liable to be placed

upon the Board in the line of its Cattle Commission duties is very liable to create a feeling which will injure the best educational work of the Board. We believe the earnest effort of the Board in its institute work has resulted in better and more profitable farming, and has fostered a growing feeling of confidence in the Board work, and we believe that the Board of Agriculture can do more good to the State if not required to inspect the cattle and other domestic animals belonging to the farmers of the State for the discovery of disease, and the resulting slaughter of their animals.

The diseases we have found in the State are treated under their several heads, as follows :

### Tuberculosis.

Our attention was not publicly called to this disease until last winter, at the time of the slaughter of a large portion of the Experiment Station herd.

We had suspected its existence in the State. We had been privately informed of the sickness and death of animals, and the description of symptoms led us to believe that death was the result of tuberculosis. We consulted legal and medical authority on the subject, and decided that we had not sufficient authority to class this disease among those diseases provided for by our statute laws, and we felt that while something ought to be done to weed out the diseased cows of the State, we were not warranted under the present conditions in making any move in that direction, but when the examination by the tuberculin test was made on the Experiment Station herd, and so many of them slaughtered and found tuberculous, we felt that something must be done immediately to relieve the dairymen of the State; and to meet the emergency and help those who did not feel willing to wait for the action of the next Legislature we issued the following circular and bond :

OFFICE OF BOARD OF AGRICULTURE.

Brandon, February, 1894.

Dear Sir:

The attention of cattle owners, and the public generally, is being attracted towards the disease called Tuberculosis. This is a

very old disease among cattle, dating to the Middle Ages, and is almost identical with consumption in the human family, and is transmittable, under favorable conditions, from the human family to cattle, and from cattle to the human family—by means of the germs of disease contained in the sputum thrown from the lungs in coughing. It is also claimed that the disease is conveyed to the human family by the use of the dairy product of tuberculous cows, the truth and extent of which is now being tested by experiments. The disease is usually of slow progress and difficult to detect by exterior appearance except in advanced stages, or when located in the lungs.

It has recently been claimed by scientists that Koch's lymph—called tuberculin—is a means of detecting the disease, even when not apparent from any outward test.

The Bureau of Animal Industry offers to furnish a limited amount of the lymph to the different Experiment Stations and Cattle Commission, provided they will slaughter such cattle as the lymph indicates have the disease, and report to Washington.

There are at the present time many experiments being made to test the danger to the human family from the use of the dairy product of tuberculous cows; also to test the efficacy of the lymph as a certain and safe guide for its detection.

On account of the unsettled conditions connected with this disease, the Board of Agriculture do not feel warranted in taking extreme grounds, but are willing to aid science in offering the services of an expert in applying the tuberculin to any herd where it may seem advisable—provided the owner of such herd will agree to slaughter and allow the examination of all that respond to the tuberculin test, without compensation from the State.

C. M. WINSLOW,
VICTOR I. SPEAR,
J. O. SANFORD,
H. W. VAIL,
J. L. HILLS,
H. M. ARMS,

Board of Agriculture.

## TO THE SECRETARY OF THE BOARD OF AGRICULTURE.

.....Vt.,..... 189....

DEAR SIR:

In consideration of free veterinary services and free use of tuberculin supplied by the State Board of Agriculture in response to my application to them for inspection of my dairy herd, I do hereby agree—

To slaughter all animals declared by the veterinarian to be tuberculous, at such time and place as he shall appoint; to allow him to make post-mortem examination of such slaughtered cattle; to afford him such assistance in slaughter and preparation for post-mortem as he may require—with the distinct understanding that I shall not hold the State of Vermont, or any person or persons, or the Board of Agriculture, individually or severally liable for payment for any animal or animals so slaughtered.

Signed,

.....

.....

Witness.

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We received a large number of applications in response to the above, and examined many herds administering the tuberculin test to several. We found about two hundred cows in herds examined under the above requests, and in herds tested independently of the Board.

The result of the whole strongly indicated that tuberculosis was scattered through the State in the dairy herds; that tuberculin was a sure diagnostic test, if properly understood and managed; that the only way to stop the disease spreading was to weed out the diseased animals.

The conditions surrounding the diseased animals which were slaughtered seemed to indicate that a diseased animal placed in the stable of healthy cows will plant the disease, which will gradually spread through the whole stable. We found one stable where an old cow had been bought and placed in the centre of a stable, and the disease had spread from one to another on each side until, when the examination was made with tuberculin, there were only two sound animals left, one at each end of the row.

In another stable we found where two cows had been bought from a suspected herd; they both had tuberculosis, and the cow that stood on each side of them had it in a less degree, indicating that in time it would have spread through the whole stable.

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## Hog Cholera.

This disease was brought to the attention of the Board soon after their appointment, and we found the method of treatment in this State and Massachusetts had been to condemn and kill.

The Massachusetts Board wrote us that they had formerly given advice as to treatment of the disease, but that so long as they had continued to pay for condemned hogs, the hogs continued to be diseased. The owners took no pains to cure them and it had cost the State of Massachusetts large sums of money, with no decrease of the disease.

They then stopped condemning, and paying, and quarantined the hogs, and the result was the owners took proper care of their stock and the disease was gradully cured. Profiting by the experience of Massachusetts, we adopted their revised policy in relation to hog cholera, and the result has been that owners took proper care of their stock, and the State was saved large expense in paying for condemned hogs.

We construed the law to be for the protection of the public against injury and loss from private carelessness or misfortune, and not for preserving the private individual from loss from his own misfortune. We found hog cholera in nearly every part of the State, but at present there are but few cases.

### Anthrax.

This disease has appeared in different parts of the State, but has been promptly reported and immediately quarantined with but slight loss to the owners.

It is a disease that, so far as we have found it, needs only care, quarantine and time to get it out of the herd. When it first attacks a herd, it takes its worst form, and some of the herd is apt to die; but it usually, as we have observed, has grown milder in its form, and the last attacked have lived and entirely recovered.

It does not seem to be actively contagious, and there appears to be no need of killing to exterminate the disease in any of the forms that have come under our notice.

### Glanders.

There have been a few cases of glanders in horses on the northern and eastern borders of the State. In each case the animal has been condemned, appraised and killed.

### Mange.

There was one case of this disease reported—among several horses in one town—which was promptly quarantined and the disease, not being allowed to spread, was cured.

### Scab in Sheep.

This disease appeared in one locality, but the premises were quarantined and the disease cured.

At the present time we believe tuberculosis is the only disease among cattle and other domestic animals in the State. We recommend a change in the law, so as to include tuberculosis in the list of diseases, to change the method of appraisal, and to have a clearly defined indemnity.

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